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SAMUEL M. FELTON, lately returned from Europe, being questioned by a Chicago reporter on the never-ending Chicago problem, the smoke nuisance, suggested that the locomotive firemen might promote both their own and the public's welfare by sending a man or men to Europe to study the art of firing. There can be no doubt that Mr. Felton saw skillful firing in England, and there can be no doubt that as a veteran railway manager he knows the firemen's brotherhood pretty well. In the nineteenth century anyone aiming to improve locomotive service would have gone most naturally to the railway manager; if the firemen needed instruction or exhortation, the way to accomplish the desired end would be through the manager. In the twentieth century, however, things are different. In suggesting an appeal direct to the firemen, Mr. Felton is following the example of the highest authority, the president of the United States, and the president follows the example of his predecessor; also of Mr. Fagan. Both Mr. Roosevelt and Mr. Taft have gone direct to the "rank and file" for counsel in matters concerning railway operation, more often than to railway officers. (Suppose the president should follow that rule in dealing with the army and navy!) But, whatever one may say in regard to the practical wisdom of the course indicated, no one can say that it is not fair to the firemen to "put it up to them." Other brotherhoods can take a lesson also. The Order of Railway Conductors might attack the chronic scandal of dishonest fare-takers. To cure that evil would be doing a valuable public service. A valuable public service will be done also whenever the Brotherhood of Railroad Trainmen shall demonstrate the economy of the "full crew" laws, which it has induced several hundred legislators to vote for.

THROUGH the monthly magazine published by the Pere Marquette, the management of this railway recently made a very full statement to its officers and employees regarding its financial condition and appealed to all on its payroll to co-operate in improving its service and increasing its gross and net earnings. It was shown that, while the road's capitalization is comparatively low, it is not prosperous, this being largely due to the fact that a considerable portion of its mileage, which was formerly logging lines, is not self-supporting. It was pointed out that its operations for the last fiscal year resulted in a deficit of $1,830,000; and that nevertheless it has to pay the same wages as its prosperous competitors. It was stated that, in spite of these conditions, the management believes if a proper effort to effect economies be made by each person connected with the road during the present fiscal year, it will be possible to show a small surplus at the end of it instead of such a large deficit. Many railway managements have to some extent adopted the policy of taking their employees into their confidence regarding the business of their roads, but few have been so frank as the management of the Pere Marquette. The results ought to be good. By placing before the employees the actual facts it is almost certain to secure better co-operation from them in keeping down expenses. Mere general statements that a large concern like a railway is unprosperous are apt to be received with skepticism by those who daily see it handling a large business, but who seldom consider the fact that a large business means large expenses, as well as large earnings, and that it is only the margin between them that keeps off bankruptcy. Furthermore, by laying the facts before employees an influence is pretty sure to be indirectly exerted on public sentiment. Railway employees are constantly coming into contact and talking with their neighbors, and the information that is given to them regarding the business of the road is sure to be passed along to others who are not connected with it. If every railway in the country would each year issue to its employees a frank and full statement, couched in simple and direct language, showing exactly what the condition of its business has been during the preceding year, how large a share employees are getting of its earnings, how large a share the stockholders are getting, the

relatively small cost of railway transportation compared with the value of the services rendered, and the various ways in which employees could with very little additional trouble and effort save large sums to the company, the results probably would be highly beneficial.

ONE of the many important points brought out in the hearings before the Securities Commission, of which President Hadley, of Yale, is chairman, is the totality of the ignorance of the general public, and even of the investing public, in the entire subject of the safety, desirability, equity in earning power, etc., of railway companies' securities as investments. This fact is not new to any one dealing in bonds or stocks, and even if the commission, in its report to President Taft, emphasizes this fact to the utmost, it is doubtful whether it will make any particular change in actual conditions; but it is worth while pointing this out in connection with a charge that is often brought against the railways that they themselves should sell their securities directly to the general public and save for the company and the stockholders the substantial commissions that are granted to bankers for underwriting these issues. As a matter of fact, the average small investor, if left to himself, could not make even an approximate estimate of the security or equity behind his holdings. He buys a certain bond or share of stock of a certain company, because it is recommended to him by a banker or bond house whom he knows and in whom he has confidence. It was the universal testimony of bankers before the commission that their customers relied far more on the reputation of the banker or bond house offering securities than on the customer's own knowledge of the property itself. This is natural enough. A man can't be a chemist because he has to buy drugs from a drug store, but the point is that no one complains because the manufacturing chemist does not sell his goods direct to the public, but allows two to three or four middlemen's profits to intervene. The general public isn't supposed to have all the qualifications of an expert druggist, but the intricate science of investment is assumed to be the common knowledge of the great American public by the stockholder who brings an injunction suit to compel his company to sell its securities directly to the public without allowing any middleman's profit.

IN construction news this week there is mention of a 30-mile line that is to be built by the Consolidated Coal Company from one of its properties in Letcher and Pike counties, along the southwestern border of Kentucky, to a connection with the Chesapeake & Ohio at Selby, Pike county, Ky. The more than ordinary interest that attaches to this news arises from the fact that it is understood that the Baltimore & Ohio is to take over this line, after the construction company—the Big Sandy & Elkhorn—have completed it, at a price which will represent construction cost and interest. This will give the B. & O. a little piece of road 30 miles long but nearly 100 miles away from the nearest B. & O. line. The Chesapeake & Ohio has a branch line running down almost due south from Ashland, on its main line on the Ohio river, to Elkhorn City, 134 miles, and it is this branch that the Carolina, Clinchfield & Ohio has been building north to connect with. The C., C. & O. has got as far as Dante, in Virginia. Dante lies right down in a pocket of the high mountains, so that to get further north it will be necessary for the C. C. & O. to build an enormously expensive tunnel, or to build a line part way up the mountain at presumably heavy grade, and then drive a short tunnel. It is doubtful whether, even if the entire coal tonnage produced by the Clinchfield corporation's mines, which lie around Dante, were to be shipped north through the tunnel, the freight earnings would pay the interest on the cost of a low grade tunnel. In all probability, therefore, the C. C. & O. will build a line up the mountain with pusher grades, make a comparatively short tunnel and then connect with the C. & O. at Elkhorn City. President Stevens, of the C. & O., has been quoted as saying that the C. & O. would lease the C. C. & O., and this is probably substantially correct, providing, of course, that the C. C. & O. can build its lines through the difficult country between Dante and Elkhorn City. At the time the C. C. & O. was building north to Dante it was estimated that the output of the Clinchfield corporation's coal mines would be 2,000,000 tons a year. If any great part of this went over the Elkhorn branch of the C. & O., it would in itself make a very busy line, but if in addition to this there is to be 3,000,000 tons delivered to this branch each year by the Big Sandy & Elkhorn, it is pretty safe to assume that there will have to be considerable double-tracking done to that line of the Chesapeake & Ohio. The acquisition of this isolated 30-mile line by the Baltimore & Ohio, with the attendant control of a heavy tonnage of coal, has other points of interest beside the business that is to be given the C. & O. branch. When the Baltimore & Ohio bought the Cincinnati, Hamilton & Dayton, the Chesapeake & Ohio was delivering to the C. H. & D. road something in the neighborhood of a million tons of coal a year for Toledo and the Lakes. With the acquisition of its own line—the Hocking Valley—to the Lakes, the C. & O. had it in its power, and would presumably find it advantageous, to turn over a good part of this tonnage to the Hocking Valley by way of the Kanawha & Michigan, rather than give it to the C. H. & D. If the B. & O. is able to originate and route a great tonnage of coal from a newly developed region in Letcher county, it can more than supply the deficiency caused by any withdrawal of C. & O. coal, by routing its Big Sandy & Elkhorn coal over the C. & O. branch as far as the Ohio river, and there possibly building a bridge, as suggested in our construction news. across the river and sending its coal to Toledo over the C. H. & D.

THE MALLET LOCOMOTIVE.

IT may be well to preface what follows with the statement that it must not be taken as an expression of editorial opinion, but merely as an echo of some of the tentative opinions or suggestions that are in the air regarding the Mallet compound locomotive. This type of locomotive has been in extended service for too brief a period to have demonstrated its superiority or inferiority on all points. It has, however, established itself as an economical factor in train operation in certain places and to such an extent that its owners are firmly convinced that it is the proper machine to use in the service in which it is employed. On the other hand, there are those with whom conditions have been so different that it is regarded with but scant favor, especially where an attempt has been made to use it in regular road work.

That it has its limitations there is no doubt, and if it had developed into a machine of all-around efficiency would be little short of marvelous, for there probably never will be another locomotive that will occupy the place that the old 4-4-0 engine did in the days of low capacity cars and short trains.

The criticisms that have been raised regarding the Mallet locomotive are not those of mechanics, but of economics. It is not a question in the minds of railway managers as to whether it will do its work, but as to what may be the limitations of its efficiency, and as to whether, all things considered, it is a cheaper machine to operate than the other type which it is replacing.

In the first place, the Mallet locomotive is usually, if not invariably, heavy, and it has been found that a track moderately well ballasted and laid with 60-lb. rails is no place for the Mallet. If used in such a place, it will distort the track and bend the rails, and if its speed is raised beyond the low limits of pusher service it will be a source of constant anxiety. Therefore, before the Mallet is purchased the track standard must be raised to a point to meet it. In one instance, at least, where this was not done, a Mallet has been sent off the line and put to work where conditions are more in accordance with its requirements.

As to its effect on track, we are still in the tentative stage of inquiry, through which we have passed with all of the principal attachments of the locomotive, such as the injector, cylinder

lubricator, use of steel castings and the like, where we had a mass of commendatory and condemnatory testimony bundled together and uttered simultaneously, because the conditions under which the contradictory opinions were formed were, in themselves, contradictory. So when one trackman says that the Mallet has no more effect on track than any other locomotive, while another announces that it is absolutely destructive, we must look to a difference in locomotives or tracks to account for it. However, this much is certain, that we know about as little as to the track stresses set up by the Mallet or any other locomotive as it is possible to imagine, and until they are investigated we must work in the dark to a great extent. The only thing that we have any inkling of is that there seems to be a probability that the Mallet does set up greater track stresses than ordinary locomotives, due, in part, to one unit running backward and thus acting like a mogul or consolidation running backward. We do know that the rail stresses are greater than when the same engine is running ahead, and to this must be added the possible increase due to the method of coupling the two units.

Again, the Mallet, as a road engine, has been criticized on the basis that its normal coal consumption while working at its maximum, is more than the average fireman can handle. This is, probably quite true, especially when applied to the heavier sizes; but, as was indicated in the Master Mechanics Convention, this need hold no longer, because it has been demonstrated that the mechanical stoker is now quite sufficient unto the task; still there are those to whom the demonstration has not yet been made, and with them the objection holds.

Another objection has also been raised to the Mallet as a road engine that is more intangible and depends for its soundness entirely upon practice, which can only be determined from an examination, in detail, of the train despatcher's sheets, in which the running time of the Mallet is compared with that of consolidations and other heavy locomotives. The objection is that the Mallet is capable of hauling trains of such great length and weight that, in order to avoid break-in-twos and the crushing of cars, they must be started and stopped so slowly and with such care that an excessive amount of time will be lost in getting over the road, and that these delays impede other traffic to such an extent as to outweigh the advantages of high tonnage. This is an objection raised by an officer of a road on which there are a number of Mallets, so that it has at least the merit of being based on experience.

The most serious arraignment of the Mallet has come from the agnostic, the popular man from Missouri, who wants to be shown things most difficult to show, and is of so intangible a nature as to appear almost academic. The criticism offered is that a Mallet locomotive is essentially two locomotives to start with, and, in addition, it carries some extras not found in the ordinary machines, such as superheaters, reheaters, feedwater heaters, flexible steam and exhaust pipes, sliding bearings for the boiler and other minor matters, all liable to derangement. And if any one of these extras, as well as any of the ordinary locomotive components, are out of order, the whole locomotive, costing not quite twice as much as an ordinary machine, must be laid up. The point raised, then, is this: Is there any real saving in operating costs if interest on the first price of the locomotive is charged against it for the period during which it is laid up? How does the lost time of the Mallet compare with the lost time of the Mikado or consolidation? And, if this lost time were to be reckoned, what would be the economic results? There is very little data bearing on this point, and yet it is one that should have great influence in deciding as to how, when and where the Mallet should be used, and it is one upon which data should soon be forthcoming so as to give some idea as to what these intangible costs may be.

This position is taken by men who stand somewhat aghast at the high maintenance cost of the Mallet. It is recognized that its repair bill should be higher than that of an ordinary locomotive, because it consists of practically two engines. But when the cost runs up to from 24 to 30 cents a mile, with the consolidation standing at from 10 to 11 cents on the same division, it does seem high. Then when we revert back to our old eight-wheelers and remember their costs of from 3 to 4 cents, the Mallet actually staggers us.

The point desired to be emphasized here is the fact that all men are not yet satisfied that the Mallet is an economical proposition, and to suggest lines along which its efficiency and operation should be investigated. Of course these things will develop in time, and the design will survive or perish according as it is fit. But this ultimate fate can be hastened by making a determination of these points. If it were to be done, it is quite probable that such modifications of design would be suggested as to improve efficiency and remove the doubts that still exist in the minds of some as to whether it should be used or not.

THE RAILWAYS AND THE TARIFF.

TWO years ago Congress passed the Payne tariff bill, so-called. Save a few special interests it satisfied no one. No reduction of the cost of living followed, and even the provision for free hides brought no reduction in the cost of shoes to the consumer. The natural and logical result followed. The new tariff became a national issue in a constituency of many millions of voters smarting under the price of commodities of prime necessity; and the next congressional election returned a great opposition majority to the House of Representatives, and all but reversed the more stable Senate—indeed quite reversed it if the matter of a dependable party majority and the inertitudes of the "insurgent" element are taken into account. Thus the tariff question instead of being settled has become profoundly unsettled. Men may differ on the question in the abstract. There is the wide gulf fixed between the absolute free trader who deems a high protective tariff a compact with Satan and the ultra-protectionist who attributes to high protective duties every economic virtue. But high protectionist and free trader alike must join with the great body of moderates in their views as to the direct effect on the business of the land of tariff uncertainties.

The unfortunate result of the situation in its bearing on the railways is that they became a target hit from two directions. The railway, in its economic character, has its analogies to the individual—that is to say, it is necessarily with producer and consumer. It produces transportation, which is, at bottom, rather a commodity than a service. Certainly it is not a service in quite the sense of that rendered by a wage earner at one end of the scale and, say, a professional man like a lawyer, at the other. From the other viewpoint, as a consumer, the railway has some obvious analogies to the individual; but, while similar in principle and in kind, it vastly outranks him in degree and in variety. Its range of consumption is well-nigh illimitable. It consumes labor in a hundred forms. There is hardly a commodity that can be named that does not enter into it as a going concern. It touches not only the raw material, but the manufactured product, and reaches out in lines that are often hard to trace directly. One might not, for example, think at first of the railway as consumer rather than producer of the mechanism of the farm. But when one reads of a company like the Canadian Pacific not only selling the land for the incoming settler, but supplying it with buildings and implements, the scope of the railway becomes more fully realized. And it may be added that probably in much larger degree than in the case of the average individual does the railway buy and, directly or indirectly, consume the commodities which the national tariff affects—and, as to price, affects upward.

But besides its more general relation to prices, there is another vital difference between the railway as a producer of transportation and the man or industrial corporation who produces something else. Within certain limits the man or industrial can readjust prices. The railway is denied that readjustment. In the former case, tariff changes can in one form

or another be met, whether it involves lower prices compensated for by extension of trade, or contraction of business; but in the latter case, that of the railway readjustment is hard, if not impossible. It is, for the present at least, refused by federal authority control of the price of its product—transportation. It is true that the greater corporations have now begun to feel federal interference more sharply. But, as yet, the actual results are indefinite, while in the case of the railways they have been very definite indeed. And, as regards tariff revision and the big corporations, there is still greater indistinctness. Where the railways must stand still and endure, the industrials retain considerable freedom of action. We shall know more when the courts interpret the word "reasonable."

But the main consideration in this question of the relation of the railways to the tariff reverts to the broad and sweeping character of the railway business. Other interests are specialized and tariff changes may affect them up or down. But the railways, as a whole, reflect general conditions. The particular railway may carry more of one kind of a commodity than another. We have coal roads and grain roads and cotton roads. But there is not a railway, however short, that has not its general business too; and, taken in its entirety, this general business is the major factor in railway traffic and returns. When, as recently, the greatest lumber company in the Northwest owing to nebulous tariff conditions cuts its shifts of men 50 per cent.; or "Schedule K" lowers production of the woolen mills; or, on the other hand, Canadian reciprocity promises enlargement of railway traffic; the matter of tariff adjustments in *some* shape of at least moderate continuity and fixity becomes from the railway point of view the prime desideratum. Other interests, whether individual or corporate, have the same feeling and motive. But with the railways, hit hardest by tariff uncertainties, the argument for the economic fixities becomes peculiarly cogent.

NEW BOOKS.

Universal Railway Manual, 1911. Edited by Captain L. E. Hopkins, Royal Engineer, Indian State Railways. Published by the Society of Railway Stockholders, London, and sold in the United States by Macmillan Co., New York. 596 pages, 7½ in. x 5 in.

This is the first edition of a manual which aims to give a concise analysis of accounts of the principal railways in the United Kingdom, India, North America and South America. The editor's introduction lays down the general principles which should guide an investor in making a study of statistics published in the manual, and lays particular stress on the lack of statistics for English railways. The analysis of the standing of each company includes a condensed income account showing earnings and expenses in the last ten years, and also gives the mileage operated, and some of the more important traffic statistics. A balance sheet as of June 30, 1910, is also included. With these figures is a short "analysis" of the financial position, history and traffic possibilities of each one of the roads. The editor says that, as far as was possible, the figures were taken directly from the annual reports of the companies themselves.

The book is intended to contain nothing which can be easily obtained from other publications, of which a list is given. The book presents the case as the public sees it and does not pretend to give inside information. In this "analysis" of the financial position and investment value of stocks of railways the editor frankly assumes the position of knowing what price is a fair one for the common stock. This is interesting rather than valuable. The book, however, is of great importance, in that it gives in a handy form a very large amount of information that has never heretofore been brought together in one publication. That is to say, its value lies in the wide extent of information rather than in the breadth or depth of the information. So far, however, as can be judged from the analysis of the American roads, the editor's judgment is keen and conservative as to values, although not conservative in method of statement. The book contains a good outline map of the railways of the United Kingdom, India, United States and South America.

Letters to the Editor.

WIDE FIREBOXES.

New York, July 10, 1911.

To the Editor of the Railway Age Gazette:

In the interest of historical accuracy, as well as in justice to the memory of James Milholland and John E. Wootten, I beg leave to correct an error of fact in the following statement of the notice of Theodore N. Ely, appearing in your issue of July 7:

"It was Mr. Ely that took the first step, alone, against the protests of many by whom he was surrounded that has led to the development of the large locomotives of today. While builders and engineers considered that the end had come, that the locomotive had reached the limit of its power, because of the restrictions current construction put upon the size of the firebox, Mr. Ely lifted his whole boiler into the air, set his foundation ring on top of the frames, widened his firebox and gave the machine a new lease of life. Many and dire were the predictions made as to the instability of the new design. But we all know the result. It did not upset, but ran with unexampled smoothness; and with construction revolutionized the whole country followed in his wake."

As a matter of fact, the design recited in the foregoing excerpt was originated and put in practice by James Milholland, on the Philadelphia & Reading in 1857, and a large number of similar locomotives were constructed and operated by him. The same design, but with a full width firebox, was reproduced and built by John E. Wootten, commencing in 1877. In a paper on Wide Firebox Locomotive Boilers, which I presented to the Western Railway Club at the meeting of November, 1895, and which appears on pages 96 to 128 of Vol. 8 of the Proceedings, I made the following statements: "Lateral increase of grate area was, as we shall see, essayed at an early date, but the wide firebox proper, by which is meant one which is located entirely above the wheels, and extended laterally beyond them for a substantial distance, was not put into practice until 1877, when the first Wootten boiler was built by the Philadelphia & Reading. The standard narrow firebox had, however, before that date, been widened to the extent of about 6 in., by making its width equal to the distance over the frames and placing it on top of the frames. This construction, which is now almost universally used in standard type locomotive boilers of large size, and particularly in anthracite coal burners, was one of the many improvements devised by the late James Milholland, then in charge of the motive power department of the Philadelphia & Reading, and was introduced by him on the engine Vera Cruz, a 15-in. passenger engine, built in that company's shops in 1857, and which had the then large grate area of 24.5 sq. ft. While this firebox is not properly within the class of wide fireboxes under consideration, it may be of sufficient interest, as a piece of history, to be illustrated, and is shown in Figs. 1 and 2."

The correctness of these statements has never been questioned, and I again submit them as matter of history. The earliest application of this construction which was made on the Pennsylvania was in the class K passenger engines, the first of which, No. 10, was built in or about 1880, and was illustrated in the *Railroad Gazette* of October 28, November 4, 11, and 18, 1881, and in *Recent Locomotives*, edition of 1883. It will, therefore, appear that Mr. Ely did not take the first step in this design, and I am satisfied that he would unhesitatingly disclaim having done so.

J. SNOWDEN BELL.

The acting premier of Australia estimates that the 4 ft. 8½-in. line which the state means to construct alongside the present 3 ft. 6-in. line from Perth Kalgoorlie to meet the Federal Port Augusta railway, will cost $7,250 per mile. The existing earthworks will be widened, but the broad gage will be entirely separate from the narrow. A proposal to take the broad line from Belmont direct to Fremantle southward along the Swan river is under consideration.

THE EFFECT OF GRADES ON OPERATING COSTS.

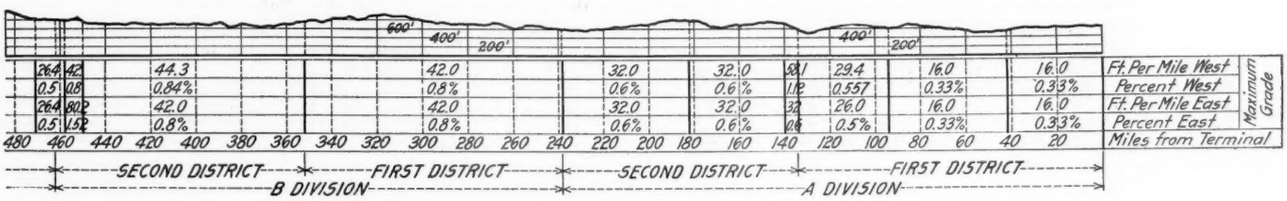
BY C. J. MORRISON.*

Each railway in the United States doing an interstate business is required to file uniform reports of its entire business, physical, operating and financial, with the Interstate Commerce Commission. There are, however, a number of facts which are not reported to the Interstate Commerce Commission, but which it is essential to know if one is to make any comparison between operating cost of two roads. The accompanying profiles are intended to in part supply some of this missing data.

When we turn to the bulky annual statistical tome issued by the Interstate Commerce Commission, we find a thousand pages teeming with closely printed and confusing tables of almost useless data and summaries, while much information, essential to any clear picture of physical and operating conditions on the railway properties in the United States, is omitted. In 1909, however, it is worth while noting that there is some improvement in this respect.

In a previous article in the *Railway Age Gazette* the writer went at some length into the comparative costs of maintenance of equipment on different roads, and it was pointed out there that when judging maintenance of equipment expenditures there are many items that must be taken into consideration other than the locomotive mileage operated, etc. This is equally true of maintenance of way. In both the maintenance of way and maintenance of equipment the topography of the country governs to a large extent. In a comparatively level country, locomotives of medium size, with large driving wheels, are able to run at fairly high speeds. Locomotives in a mountainous district are much heavier, are equipped with smaller driving wheels and must run at slow speeds, thus increasing the maintenance of equipment cost. There are given herewith the profiles of

COST OF FREIGHT LOCOMOTIVE REPAIRS AND FUEL ON LEVEL AND MOUNTAINOUS COUNTRY FOR 12 MONTHS PERIOD.



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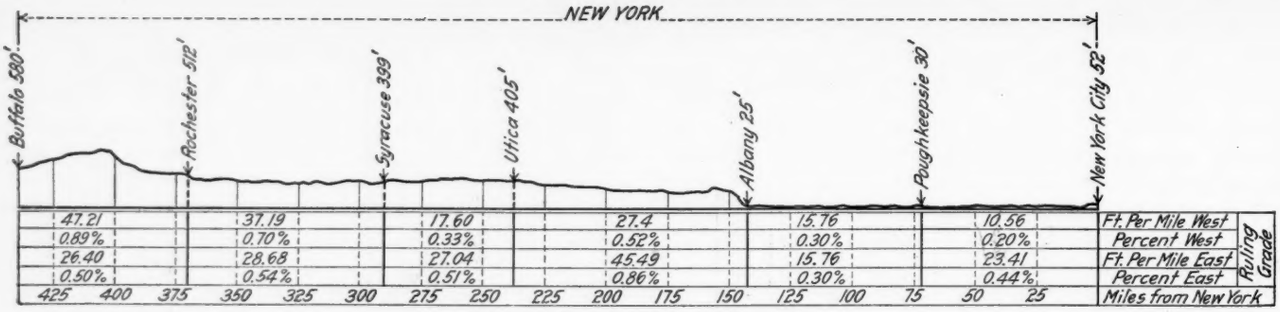
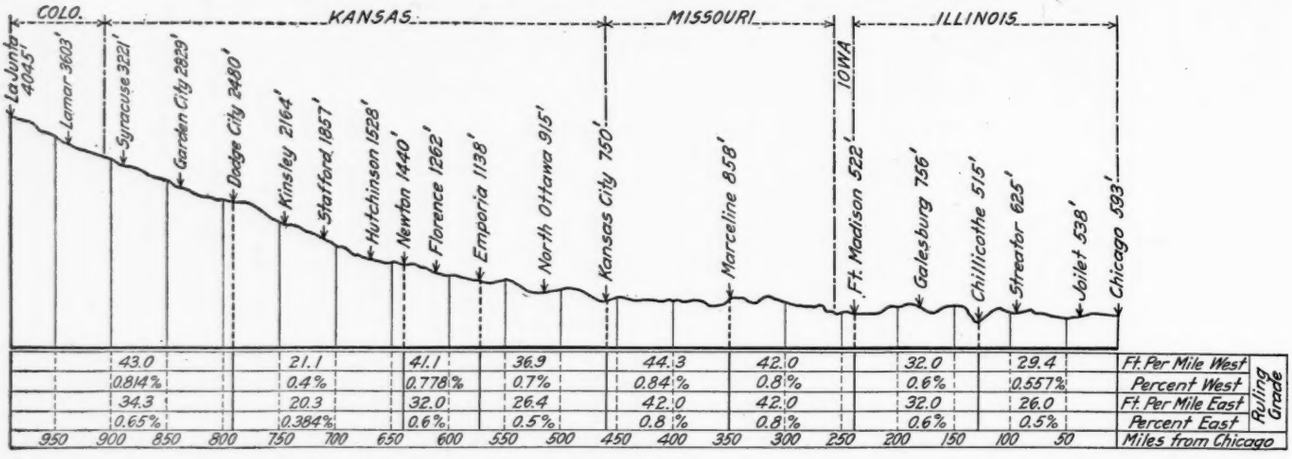
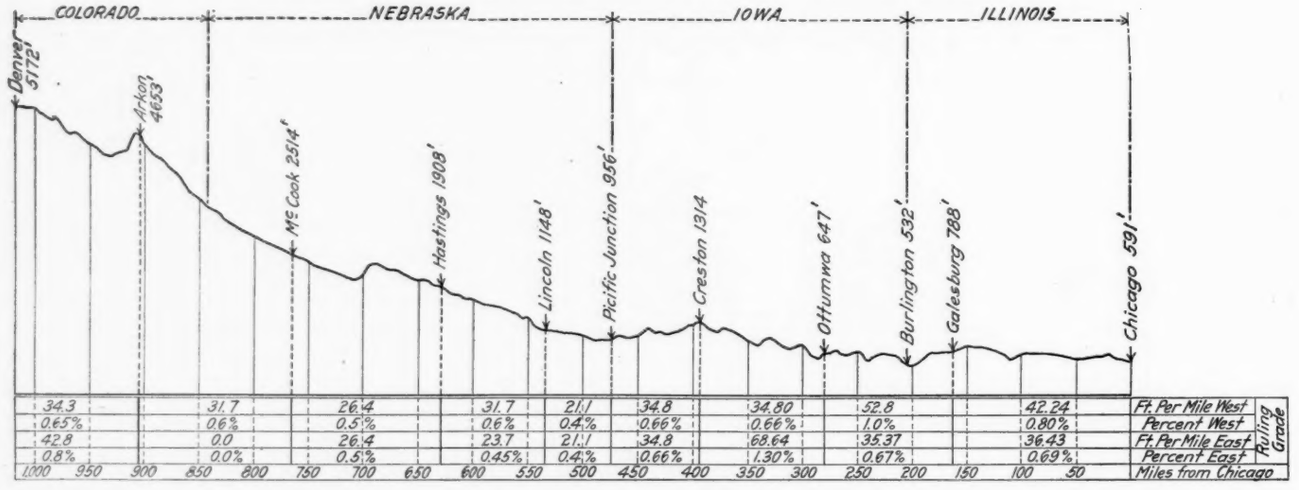


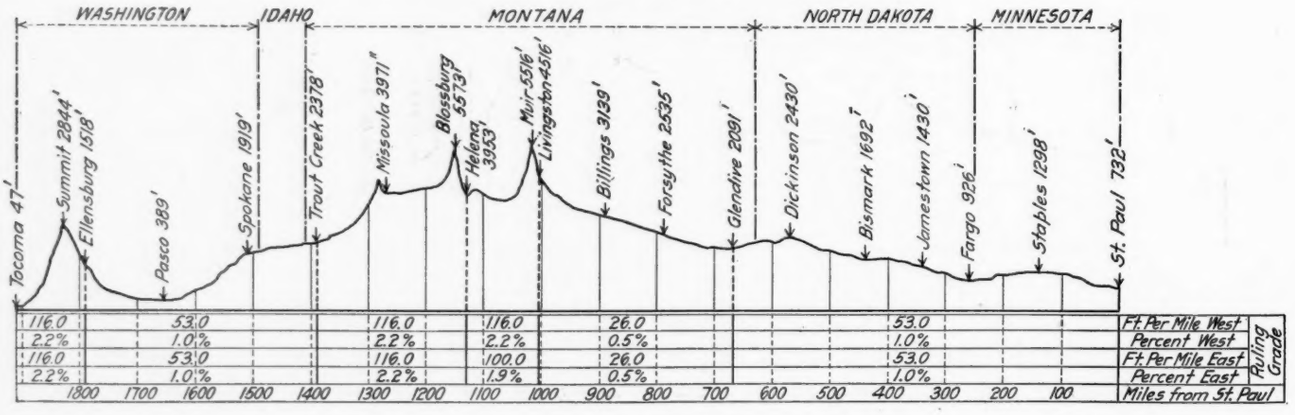
Profile of the New York Central & Hudson River; New York to Buffalo.



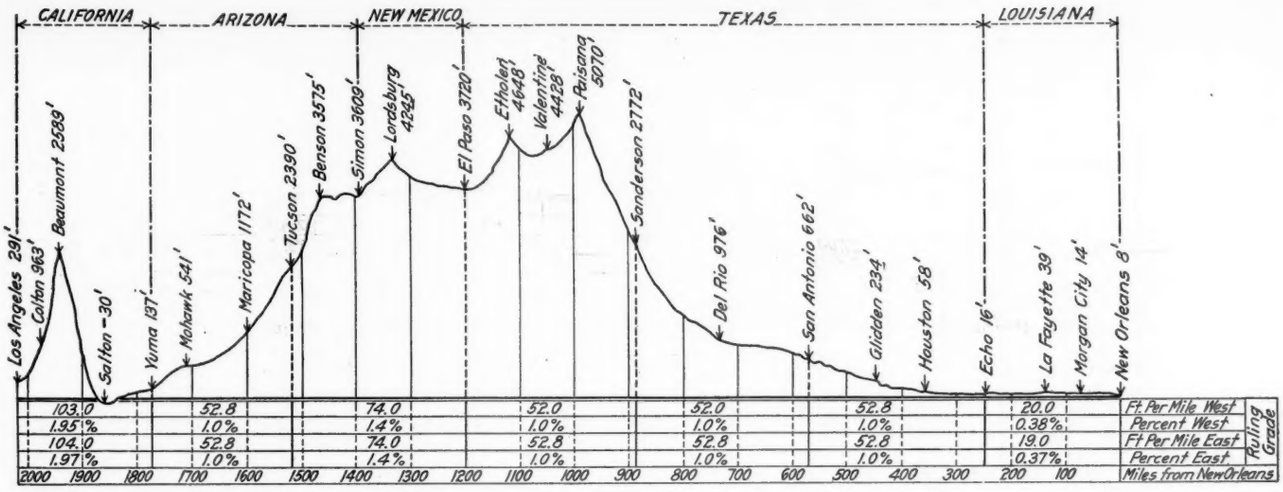
Profile of the Atchison, Topeka & Santa Fe Line from Chicago to La Junta.



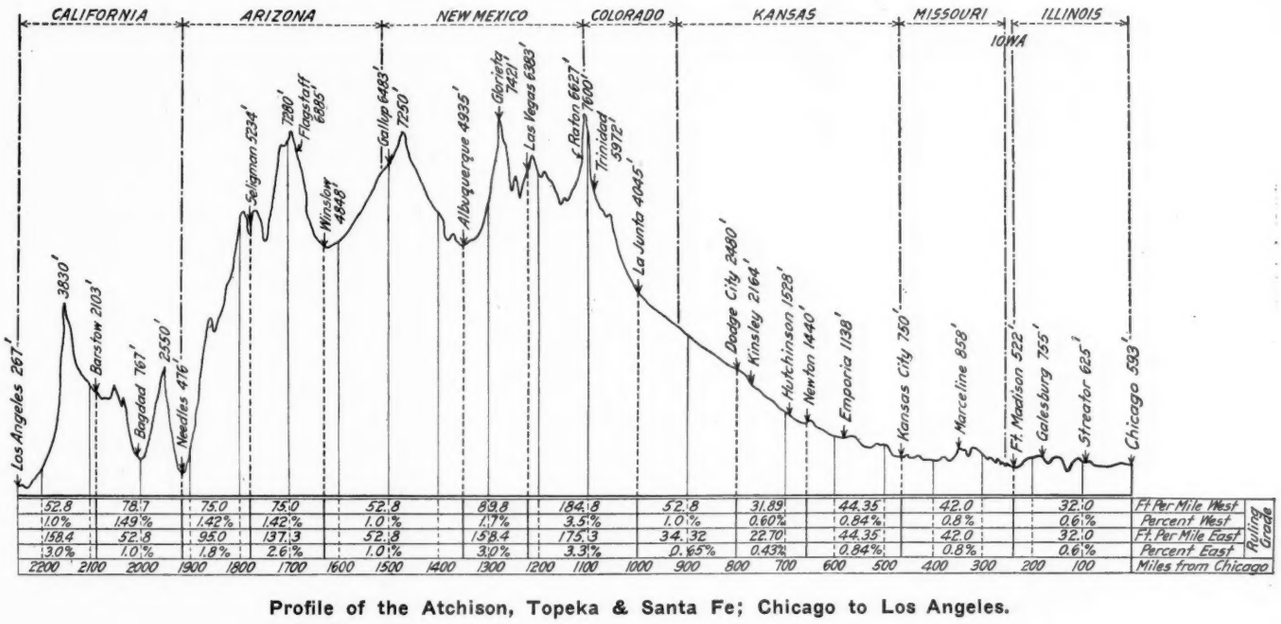
Profile of the Chicago, Burlington & Quincy.



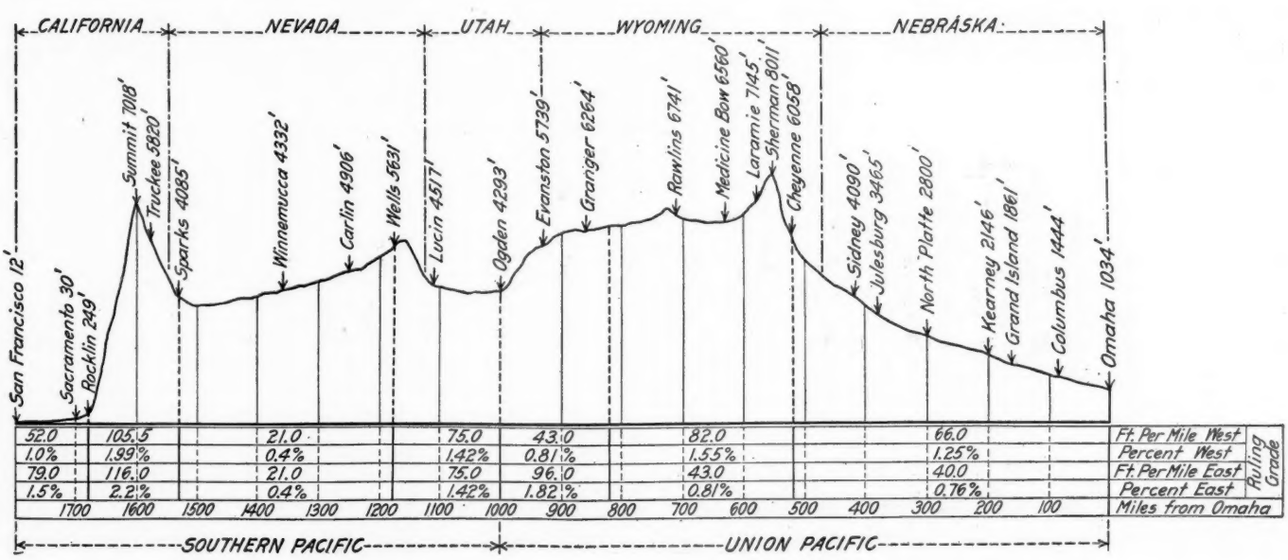
Profile of the Northern Pacific.



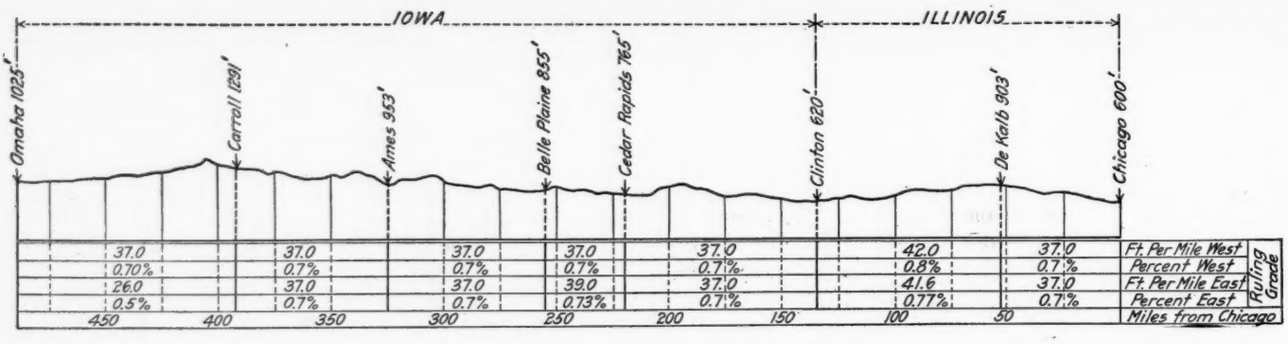
Profile of the Southern Pacific and Sunset Lines.



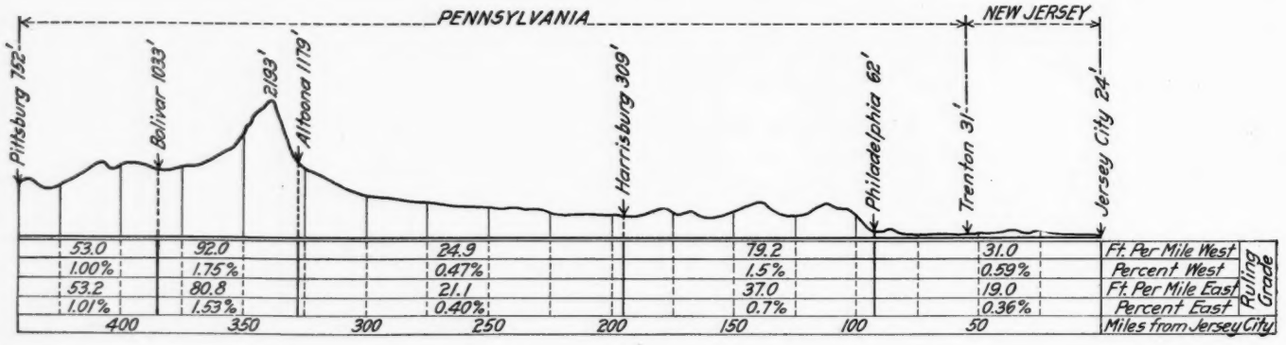
Profile of the Atchison, Topeka & Santa Fe; Chicago to Los Angeles.



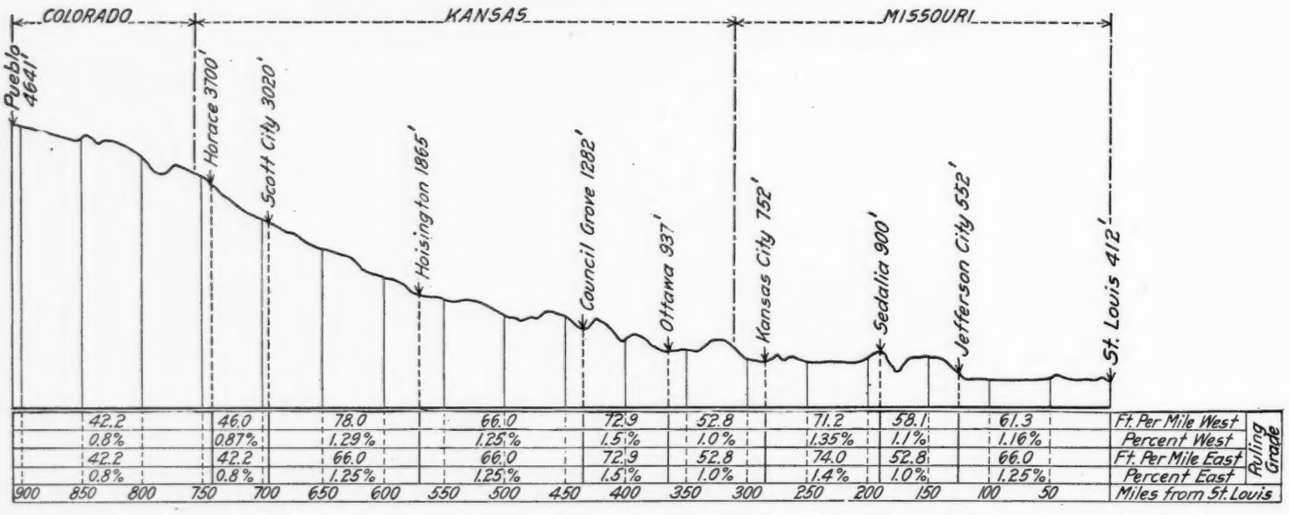
Profile of the Union Pacific-Southern Pacific Line from Omaha to San Francisco.


IOWA
ILLINOIS
Omaha 1025'
Carroll 1291'
Ames 953'
Belle Plaine 855'
Cedar Rapids 765'
Clinton 620'
De Kalb 903'
Chicago 600'
37.0 37.0 37.0 37.0 37.0 42.0 37.0 Ft. Per Mile West
0.70% 0.7% 0.7% 0.7% 0.7% 0.8% 0.7% Percent West
26.0 37.0 37.0 39.0 37.0 41.6 37.0 Ft. Per Mile East
0.5% 0.7% 0.7% 0.73% 0.7% 0.77% 0.7% Percent East
Ruling Grade
450 400 350 300 250 200 150 100 50 Miles from Chicago

Profile of the Chicago & North Western.


PENNSYLVANIA
NEW JERSEY
Pittsburg 752'
Bolivar 1033'
2193'
Altoona 1179'
Harrisburg 309'
Philadelphia 62'
Trenton 31'
Jersey City 24'
53.0 92.0 24.9 79.2 31.0 Ft. Per Mile West
1.00% 1.75% 0.47% 1.5% 0.59% Percent West
53.2 80.8 21.1 37.0 19.0 Ft. Per Mile East
1.01% 1.53% 0.40% 0.7% 0.36% Percent East
Ruling Grade
400 350 300 250 200 150 100 50 Miles from Jersey City

Profile of the Pennsylvania Railroad.



Profile of the Missouri Pacific Main Line West.

a number of the larger roads in the United States. Profiles of roads are not generally included in the annual report to the stockholders, the new Chicago Great Western being a notable exception. Neither are profiles given in the annual report of the Interstate Commerce Commission. The profiles that we publish, therefore, are intended to be of some service in any analysis of maintenance costs that may be based either on the reports of the railways to their stockholders or on the figures compiled by the Interstate Commerce Commission.

To give some idea of how largely operating costs are affected by the topography of the country, two lines, one through mountainous country, and the other in fairly level country, are compared.

The cost for locomotive repairs and fuel is thus 59 per cent. greater for the mountainous districts than for the level districts, although compound locomotives are used and shop practices and supervision of fuel are the same on both territories. Nevertheless it would be unreasonable to expect to bring the grades of the mountainous districts down to those of the more level districts.

COST OF LOCOMOTIVE REPAIRS AND FUEL IN LEVEL AND MOUNTAINOUS COUNTRY—MAIN LINE FREIGHT—12 MONTHS PERIOD.

	Level Country.	Mountainous Country.
Total 1,000 gross ton miles	5,300,827	4.049,015
Road mileage	770	1,000
Density of traffic, per road mile, 1,000 g. t. m.	6,884	4,049
Total cost of repairs	$599,689	$647,886
Total cost of fuel	797,040	1,051,296
Total	$1,396,729	$1,699,182
Cost of repairs, per road mile	$779	$648
Cost of fuel, per road mile	1,035	1,051
Total	$1,814	$1,699
Cost of repairs and fuel, 1,000 g. t. m.	$.264	$.420
Increased cost of repairs and fuel on 1,000 g. t. m. basis of mountainous over level country	.....	$631,646
Per cent. increase per 1,000 g. t. m.	.....	59.1 per cent.
Increased density of traffic	70.1 per cent.	.....
Cost per road mile at traffic density of level country	.....	$2,888
Increased cost per road mile	.....	$1,189
If business were increased 70 per cent. on the mountainous country, so that the density of traffic should be as great as on the level country, the increased cost for locomotive repairs and fuel would be 1,189 x 1,000, or	.....	$1,189,000

LETTERS FROM AN OLD RAILWAY OFFICIAL TO HIS SON, A GENERAL MANAGER.*

IX.

CHICAGO, June 3, 1911.

My dear Boy: It has doubtless occurred to you how worthless as evidence are many of the office files. How can any one tell a year afterward whether the general manager or the superintendent ever saw the telegram on which his name is typewritten? On most roads any one of a half dozen or a dozen people may have dictated the message. How much better, as under the unit system, to have every man doing business in his own name! He can then supplement the written record with much more intelligent recollection of events related to the transaction. We dictate the most important telegrams, which pass unquestioned, without an autograph signature. This is common sense and just as it should be. When an unimportant letter is written somebody has to get out a pen and sign some name or other. How inconsistent. Why not, for certain kinds of correspondence, let the stenographer typewrite the name of the dictating or signing official, and then authenticate with the office dating stamp or a private seal mark? The office dating stamp should be kept under lock and key in official custody in order that it may be used for authentication, like the seal of a notary public. To save the labor of constant signing I predict that some time we may go back to individual personal seals, carried on a finger ring or a watch fob. That is the way they authenticated documents at a time when the gentry felt themselves above learning to read and write.

If you have occasion to dictate a message over the telephone from your house at midnight, do not let the operator imitate you autograph signature, but have him print your name with a pen, pencil or typewriter. Also, take good care to have such messages sent to you afterward for you to check. Your time is valuable, but it cannot be put to better use for the company than in insuring the integrity of your individual transactions. It may be that no record whatever is necessary. With all our craze for accumulating files we do not record many telephone conversations. You must be the judge as to whether a record for your office is necessary, and in such exceptional cases state your wishes at the time. The farther down the employee the more zealous is he to escape possible censure by preserving unnecessary information. What we need is one complete record of a transaction rather than so many partial records. Many of the telegrams sent from a superintendent's office should, after sending, go to the main file room for consolidation with related papers under a subjective classification. It is more logical to file certain classes of messages by days in date order. For example, messages relating to train movements should usually be filed in date order since they are supplementary to the train sheets of that particular day, and the date would be the determining factor in tracing the transaction afterward. These two distinct classes of messages should be filed, the one under a subjective classification, the other under a serial classification. The good, old-fashioned way of rolling together all the messages of the day and cording them in a pile on the top shelf was all right in the day of wood burners, but falls short in this day of higher pressures. Remember, too, that the telegraph office is a part of the same establishment. Wherefore, make a carbon copy of every telegram that is going down the hall to be transmitted.

If you wish to get real busy and cultivate patience, try to introduce a uniform filing system in all the offices on the road. Every fellow will tell you that the system in his office is best. The acid test is: "Will your system fit the president's office?" and the stereotyped reply is, "You see we are very different. Our local conditions are peculiar." So it falls out that when the agent writes his superintendent about office furniture, for example, the agent, if it is a big station, gives the subject a file number. The superintendent gives it a second number. If perchance the general superintendent, the purchasing agent, the general storekeeper, the general manager, and the president should happen to get hold of the papers, each office would affix a different number. You might have on the same railway as many as seven different file numbers for the same subject. Remember that all filing systems are arbitrary. Whether you designate office furniture as seven, eleven, twenty-three, or forty-four, it rests in the breast of somebody to say what that designation shall be. It is like numbering trains, cars and locomotives, we take some arbitrary basis from which we build up a logical classification. Formerly, trains, cars and locomotives were given serial numbers in the order of creation. So were letters in an office. Now the proposition is too big and we assign series of numbers for classifications which are more or less self-suggesting. Any number of men have tried to work out a filing system based on the Interstate Commerce Commission classification of accounts. Any number of men have soon encountered limiting conditions which seem to preclude a satisfactory solution.

If you had time, I do not doubt your ability to work out the best kind of a filing system, but you have not the time. If you had lived before George Stephenson you might have invented the locomotive, but George beat us all to it. If you had time you could work out a table of logarithms, or a table of trigonometric functions. Life is so short that it is better to use the tables that other people have prepared. By the same token, if I were you, I would save my company money by adopting Williams' Railroad Classification. It is an expansive, but not expensive, decimal system suitable for everybody from the station agent to the president. Among the roads that have taken it seriously are the Baltimore & Ohio, the Delaware & Hudson, the Pennsylvania, and the Harriman Lines, not such a puny lot. Others say of it as of the unit system of organization: "We are watching its development with much interest." In either case, if the stockholders and directors are complacent, you and I have no kick coming as to the number of years over which this inactive watchfulness may extend.

The manifest advantages of a uniform filing classification are the time saved in avoiding duplication of numbers, and the practical familiarity possible to officials and employees of all grades and locations. When a man is promoted or transferred, he does not have to learn a new filing system. Instead of the whole burden of filing being upon a file clerk, everybody can be helping to preserve the integrity and insure the efficiency of the system. It is not necessary to sit up nights and memorize filing numbers. Take the matter seriously and in a short time you will unconsciously absorb the most important numbers, just as you get trains, cars, and locomotives in your head. Officials frequently have a disproportionate and exaggerated sense of the value of their own time. They are paid to think from their presumably wider understanding. If the official by one minute's thought can dictate the file number and later on save several hours of search in the file room, it is his duty to do so. All over the country file clerks tell me their troubles. The burden is, "If you will get the officials to respect the files as much as we respect the officials, it will all be easy." You know, my boy, that there are a whole lot of things that deserve to be taken just as seriously as we take ourselves. Consider this standard code of train rules again. With all its defects and shortcomings it is a vital force. Because it is standard it gains a respect as a result of lifelong drill and discipline of employees, regardless of changes in location or assignment. Therefore standardize your files, and interest your officials. Rank imposes obligation, or *noblesse oblige* as the French say.

It is a much easier matter to start a new filing system than is generally supposed. Just begin. It is not necessary to renumber the old files. Give new numbers to all the old stuff that comes in and in a month or two you will probably absorb nearly all that is of current interest. Then store the remainder of the

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old stuff as a dead file under the old system. Most of the old you will never need, but if you do, as occasion arises, locate under the old system and transfer to the new.

If you are putting up a new office building or re-arranging an old one, try and locate the main file room next to the telegraph office. Or put one over the other so that quick communication can be made by some such device as a chute, dumb waiter, or pneumatic tube. Telegrams received can then be hurried to the file room and related papers attached, when desirable, without taking the valuable time of an official to send to the file room for them. Here is a place for a really rational conservation of official time. The effect of effort should be in proportion to its intelligence and intensity rather than to its amount.

Experts long ago established the fact by time studies, and otherwise that flat, vertical filing cases are the most efficient and economical. There are a number of satisfactory makes on the market. Like selecting a typewriter, it is largely a matter of personal preferment. The way to beat another man at his own game is first to sit in, play and learn. Gamblers would become extinct if all men lived up to this advice. Most railway officials regard organization as an exception to this precept because, as I said before, nearly every man flatters himself that he is a born organizer. Before you raise the stakes too high in trying to beat another man's game of organization, better first sit in and play in his way.

Do not be afraid to trust outlying offices, like those of your superintendents, to run their own files. Have them inspected as often as may be necessary to insure uniformity and efficiency. Do not forbid their adding numbers as emergencies arise. Assemble these new subjects periodically, say once in six months, for standardization, and amplify the working numbers if necessary. You must allow for differences in the human equation. Some men are strict constructionists, and some are broader. Some men classify under a few subjects, while others subdivide to a greater degree. You know the old story of the man who was indexing and feared that something might be overlooked. So under the caption, "God," he put the cross reference, "See Almighty God." Without a retrospective study of actual performance you cannot well say just how many sub-numbers shall be used in a given office, any more than you can determine in advance how many train orders a certain despatcher should put out under the standard code. Among the advantages of using a card index for running a file is that by counting the live cards we know the number of subjects in actual use. This is not inconsistent with book numbers, the book then being used as a reference encyclopedia from which subjects are entered on cards as fast as each necessity arises.

Remember that while immutable principles must eventually triumph over local conditions, much depends upon considerate application. The local condition didn't just happen, but had its origin in some good reason, good or bad, perhaps once convincing but now outgrown. Sometimes the reason is so vital as to be a principle in itself. In our beloved Southland there are local conditions of society which do not obtain elsewhere in this country. True Southerners thank God that human slavery has been abolished. They are striving earnestly and successfully to adjust conditions created in the birth pangs of a social revolution. Well managed railways like the Louisville & Nashville adjust their working policies to these basic conditions. Nearly a decade ago Samuel Spencer, as president, felt that the Southern Railway needed an infusion of new operating blood and a rotation of types. Both excellent things in themselves but, as experience showed, easily overdone and carried to an irrational degree. With native talent at hand for the developing he imported to the proud old civilization of his birth some rough and ready brethren of the western prairies. These earnest men and their followers knew how better than they knew why. They were long on art, but short on science. Demoralization and wrecks, attributed to inadequate facilities, cost the road much public confidence, cost the stockholders hundreds of thousands of dollars, and finally, in an awful tragedy, cost the able president his useful and honored life. Fate accorded to outraged sociology and her smaller sister, organization, terrible and undeserved retribution. For, barring this one mistaken policy, Samuel Spencer was an earnest patriot and a constructive railway statesman. As a youth he served in the Confederate army. Through life devotion to his flag was a passion. As a man and a gentleman his character was unblemished, his integrity was stainless. Peace to his ashes. Success to the Southern. Its great traffic strength, actual and potential, rests on the broad foundations laid by Samuel Spencer. Prosperity to the railways. By constant search for the lessons of human efficiency to be drawn from such experiences as these, they prove their broad claim to scientific management.

Affectionately, your own,

D. A. D.

FREIGHT CLAIMS PROMPTLY SETTLED.

There has been a revolution in freight claims; bills for loss, damage and overcharge are adjusted in 30 to 60 days, where formerly there were delays of many months. This we have on the authority of the Railway Business Association, George A. Post, president, which has been investigating the subject, and has printed a pamphlet to tell about it. The association has made inquiries of shippers and associations all over the country, and reaches the unequivocal conclusion that by the co-operative action of the railways, the shippers and the government, a "national grouch" has been transformed into a fast spreading satisfaction.

J. M. Belleville, chairman of the freight claims committee of the National Industrial Traffic League, says that he has had no real complaints from the members of his league for more than a year. The railway claim agent who formerly spent his energies in interposing technical objections and who deemed it his chief duty to prevent the settlement of claims, just or unjust, has been subdued and is being rapidly exterminated. Marked improvement in the settlement of claims began about five years ago, and during the last two years progress has been phenomenal and extremely gratifying. This is largely due to the policy of shippers in co-operating with the railways instead of entering suits in the courts. Shippers have improved their methods of packing goods; they mark packages more legibly and intelligently, and in case of loss or damage furnish the legal proofs promptly. Mr. Belleville's association has issued many circulars instructing shippers in these matters. Straight overcharge claims are now settled inside of 30 days, and a number of large concerns report that for the year 1910 all claims of all kinds were settled on an average in less than 60 days.

Testimony in this same general line is quoted from J. S. Lincoln, St. Louis; E. L. Fairbanks, manager of the freight claim department of the Pacific Coast Shippers' Association; E. J. McVann, manager of the traffic bureau of the Commercial Club of Omaha; F. C. Broadway, traffic manager of the Missouri Lumber & Land Exchange Company, Kansas City; P. W. Coyle, Business Men's League, St. Louis; J. W. Hicks, Chicago; N. B. Kelly, Philadelphia Chamber of Commerce, and others. The Chicago, Burlington & Quincy is named as one of a number of roads which notify patrons of overcharges developed in checking billing. The Chicago Association of Commerce has made a canvass of shippers, and finds all but a very few expressing marked satisfaction. An exception is noted in the fact that within the last year the action of the Interstate Commerce Commission, in forbidding payment before liability is established, has checked the improvement that was going on. Chicago shippers report that there is still need of improvement at small towns where the consignee is not so well informed and the railway representative has less authority. Sears, Roebuck & Co., Chicago, report that the amount of unsettled claims against railways is only one-tenth the former amount. Members of the Traffic Club of Pittsburgh say that not for several years has any shipper who is a member of the club had a controversy before the Interstate Commerce

Commission with a railway which is a member of the club. In the southwestern states a confidential canvass among station agents shows that almost without exception shippers are better satisfied than formerly. In New York City neither of the three commercial bodies has found it necessary to establish a freight claims bureau. The most difficult claims to deal with are those connected with shipments of fruit and produce; but the president of the Fruit and Produce Trade Association of New York reports a great improvement, and it is admitted that much of the trouble in the past has been due to the carelessness of shippers in marking and billing their goods. Receivers of cotton in New England reported a decided improvement. A large manufacturer in Boston reports that his claims against prominent roads have been reduced in six years 65 to 84 per cent.

The editor of the pamphlet goes on to describe what is necessary to be done both by railways and by shippers to continue and to improve the good work, giving advice to both sides. Reference is made to the work of Mr. Richards of the Chicago & Northwestern in improving the conduct of the men in the freight houses and on the freight trains of that road. Mr. Gatchell of the Southern Railway, Mr. Nash of the Delaware & Hudson, Mr. Barlow of the Erie, Mr. Kenly of the Atlantic Coast line, and Mr. Levy of the St. Louis & San Francisco have done good work in this direction.

TRAIN ACCIDENTS IN JUNE.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of June, 1911. This record is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd	Inj'd.
2.	Penn.	Downington.	rc.	F. & F.	0	0
5.	C., R. I. & P.	Peoria.	xc.	P. & F.	1	2
5.	Tennessee Cent.	Nashville.	xc.	P. & F.	0	15
*7.	N. Y., N. H. & H.	Fairfield.	rc.	F. & F.	4	0
9.	Atch., T. & S. F.	Domingo.	bc.	P. & F.	1	20
20.	Central Vt.	Randolph.	xc.	P. & F.	0	20
21.	Tennessee Cent.	Mill Creek.	bc.	P. & F.	2	20
23.	Kanawha & M.	Athens, O.	bc.	P. & F.	2	0
24.	Kansas C. Southern.	Kansas City.	bc.	F. & F.	0	2
†28.	Phila. & Reading.	Philadelphia.	xc.	P. & F.	1	21

Derailments.

Date.	Road.	Place.	Cause of derailm't.	Kind of Train.	Kil'd	Inj'd.
1.	Missouri Pacific.	St. Louis.	See below	F.	1	3
†2.	M., St. P. & S. S. M.	Vergas.	washout.	P.	1	3
5.	Grand Trunk.	Lennon.	wind.	F.	0	0
6.	Atlantic C. L.	Jacksonville.	open draw.	P.	0	1
*7.	St. Louis & S. F.	McBride.	bridge.	F.	1	2
12.	G. C. & S. F.	Houston.	d. switch.	P.	1	1
†12.	Col. Spgs. & C. C.	No. Cheyenne.	unx.	P.	1	0
18.	Louisville & Nash.	Whitewood.	washout.	P.	1	8
19.	Boston & Maine.	Plymouth.	unx.	P.	0	0
20.	Chi., R. I. & P.	McFarland.	unx.	P.	0	4
24.	Southern	Salisbury.	unx.	F.	1	1
27.	Chi., M. & St. P.	Bardwell.	unx.	P.	2	10
28.	Chesapeake & Ohio.	Aden.	unx.	P.	1	1
30.	Southern Pacific.	Tunnel, Cal.	acc. obst.	F.	2	1

Other Accidents.

Date.	Road.	Place.	Cause of Accident.	Kind of Train.	Kil'd	Inj'd.
2.	Penn.	Columbus, Ind.	b. rod.	P.	1	0
2.	Union Pacific.	North Platte.	boiler.	F.	3	0
14.	Atch., T. & S. F.	Walong.	powder explos.	F.	0	0
27.	Southern Pacific.	Mescal.	fire.	P.	0	0

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

The collision at Fairfield, Conn., on the 6th involved four trains. An eastbound freight which had run past a distant and a home block signal set against it crashed into the rear of a preceding freight at full speed, and coals from the firebox set fire to the wreckage. The wrecked cars fell over all of the four main tracks, and two westbound freights, one on each of the two westbound tracks, were derailed by the wreck, though the engineman of one of them succeeded in pulling a part of his train past the derailed cars of the eastbound train before they had fallen far enough to foul the westbound track. About 20 cars were demolished, and the fire was not extinguished until the arrival of the town fire engines. Five trainmen were killed and 3 injured. From the testimony given at a coroner's inquest, it appears that the engineman at fault (who was killed) was using steam at the moment of the collision, and that torpedoes and fuses had also been properly placed to protect the leading train, which had been stopped on account of a hot journal. The coroner, in his finding, says that the engineman was a normal, healthy person, that he had been in the employ of the road for several years and that he had not been overworked.

The train derailed on the Boston & Maine at Plymouth, N. H., on the 19th was the "Canadian Pacific Express" from Montreal to Boston; and the train was running at about 50 miles an hour on a straight line. Every one of the six cars ran off the track, but no person was seriously injured. An officer of the road says:

According to the best evidence obtainable, the tender first left the track, and the six cars followed it, the engine remaining on the rails. The roadbed is of coarse gravel and was in first-class condition; ties good and sound, rails of 85-lb. pattern, laid in 1910 and well spiked. Nothing to criticise could be found in the roadbed, ties or track. The engine was of the Pacific type, in perfect condition, having been in service about two months. Thorough expert examinations have determined nothing as to cause. The train ran about twice its length, when it was brought to a stop without serious damage to anything or injury to anybody.

The derailment at Vergas, Minn., on the 2nd occurred at 11 p. m., and was due to a washout. The passenger killed was in a private car, being the wife of L. S. Berg, president of the New Orleans, Mobile & Chicago; and Mr. Berg himself was injured. Eight of the eleven cars in the train ran off the track and three of them were burnt up. The derailment at McFarland, Kan., on the 20th is reported as due to some cause undiscovered. Four cars were derailed, including two sleeping cars and the private cars of Vice-president Melcher and General Manager Sweet. Both these men were slightly injured, as were two other officers.

The derailment at St. Louis on the first was due to the sudden stoppage of a long freight train by the application of the emergency air brakes; the slack was taken up so quickly that five cars in the middle were pushed out on one side. These cars fell against a building and killed a man who was walking along the track. The engineman had applied the brakes in emergency because of fear that his engine would run over a woman and a little girl who had suddenly stepped on the track a short distance in front of him to get out of the way of a train on another track.

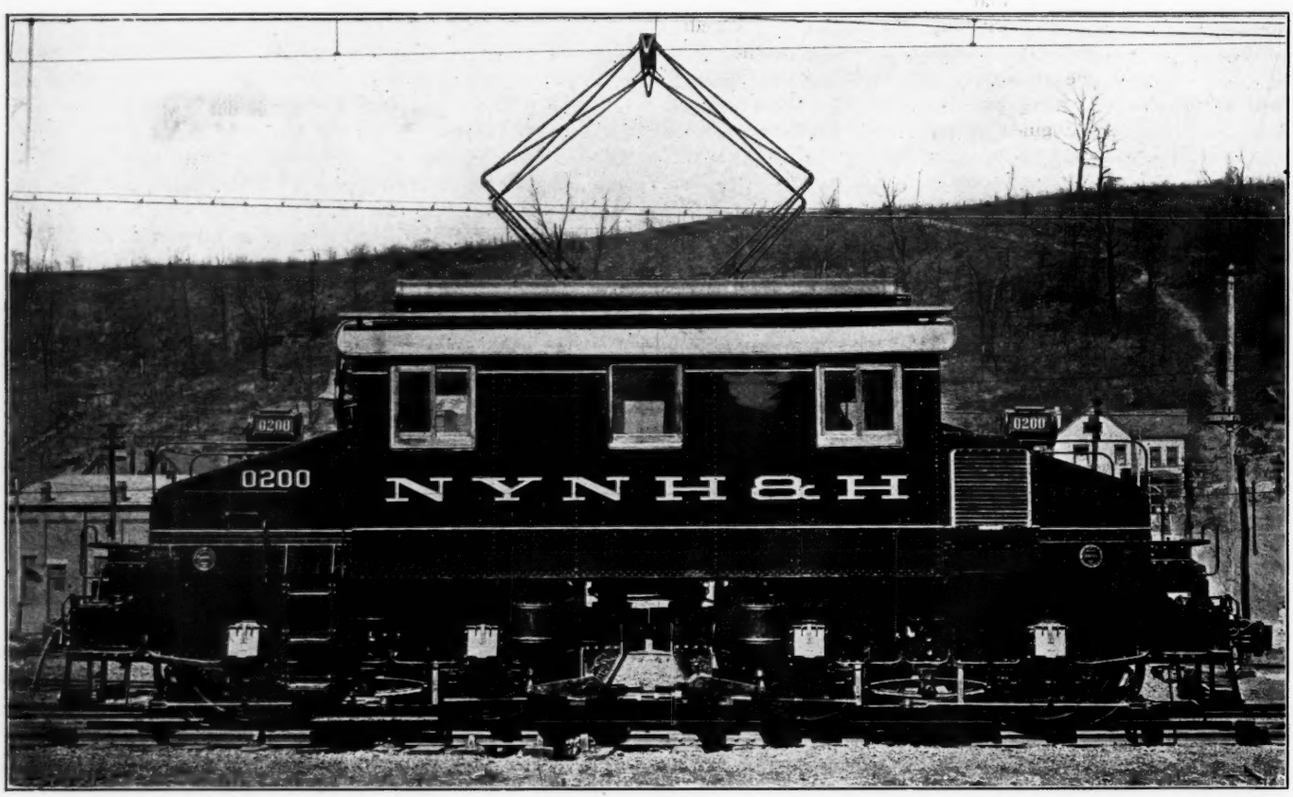
Electric Car Accidents.—Of the 22 electric car accidents reported in the newspapers as having occurred in the United States in the month of June, none seem to have been attended by fatal results, but there were several in which the injured persons numbered 20 or more.

Canadian.—One passenger was killed and 25 injured in the derailment of an express train of the Grand Trunk at Newcastle, Ont., on the 16th; and two trainmen were killed and four injured in a butting collision of freight trains on the Canadian Pacific. This was on the 19th, and occurred somewhere near Appele, Sask.

ELECTRIC SWITCHING LOCOMOTIVE; NEW YORK, NEW HAVEN & HARTFORD.

A new type of electric locomotive for switching service has recently been delivered to the New York, New Haven & Hartford by the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., who applied the electrical features, while the Baldwin Locomotive Works supplied the mechanical parts. This locomotive is of special interest, not only in some of its structural features, but because of its being the first articulated truck electric locomotive of large capacity built in this country exclusively for switching operation in the heavy freight yard service of a trunk line.

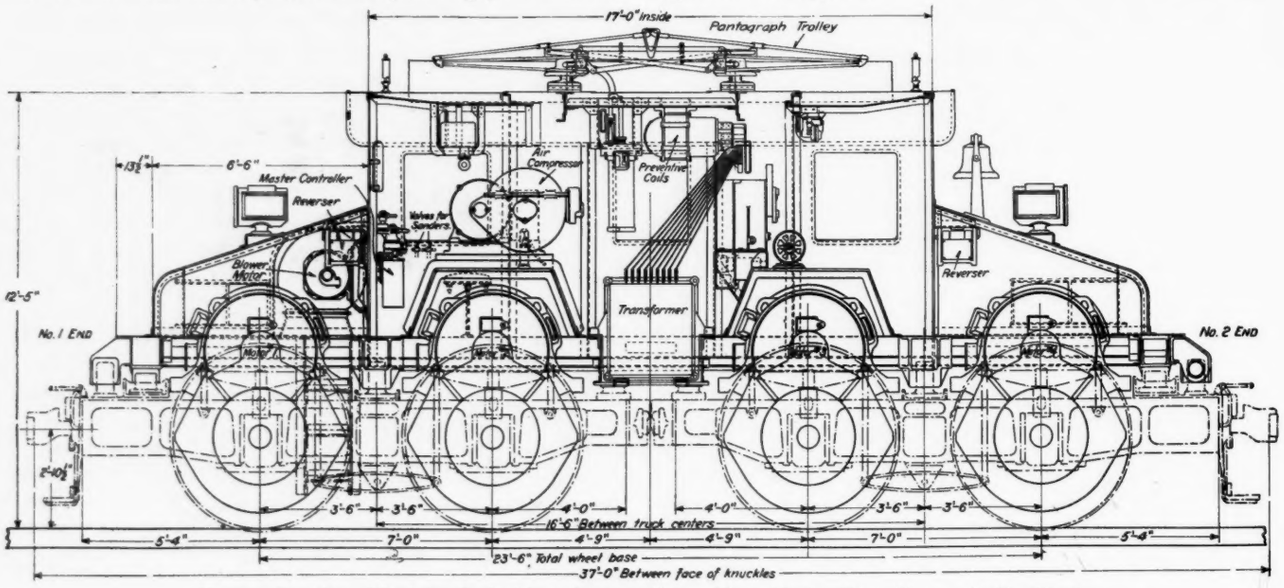
Since the electrification, over three years ago, of the New York division from Stamford, Conn., to Woodlawn, N. Y., New Haven passenger trains have been electrically operated; but the Harlem River division and the Mott Haven yards, together with most of the freight service on the main line, have been operated by steam power, as formerly. The electrification of the Stamford yards is completed and that of the Harlem River division and the Mott Haven yards is under way and will be in operation this summer. In the near future all traffic, on the New York end of the main line and on the Harlem River division will be electrically handled.



Articulated Truck Electric Switching Locomotive.

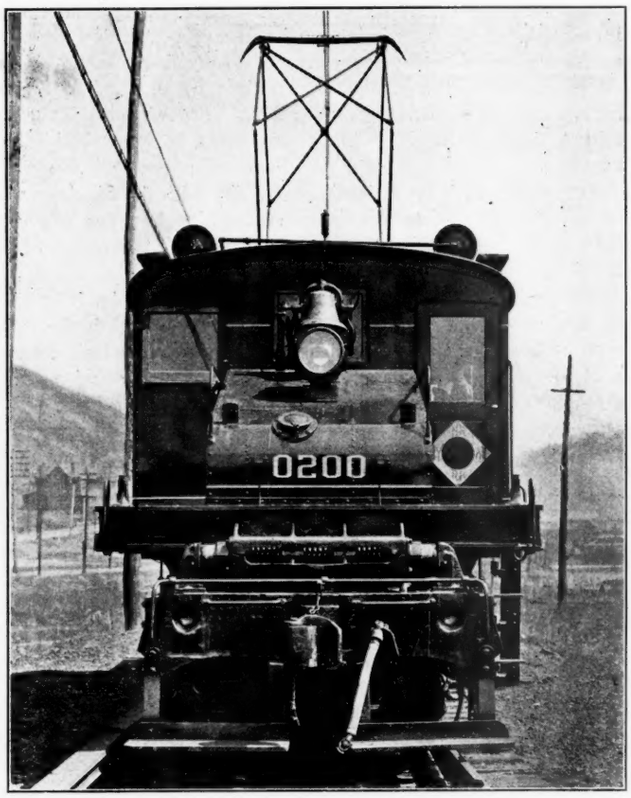
In making a study* of steam switching locomotives at the

*From a paper presented by Mr. Murray before the American Institute of Electrical Engineers at Toronto, Can., and abstracted in the *Railway Age Gazette* of April 14.



Heavy Service Electric Switching Locomotive; New York, New Haven & Hartford.

Harlem River yards with a view to replacing them by electric locomotives, William S. Murray, electrical engineer of the New Haven said: "In switching, yard speeds can be greatly increased by the use of an electric switcher of very much less engine capacity than was used in the steam switching. On account of the low average rate of energy required for their operation, the central power station will deliver at a far higher efficiency the power necessary to the electric switching locomotives than that obtained from the power plant individual to the steam switching engine itself. Immediate application of this statement is seen in the ratio of the pounds of coal burned to the number of horse-power-hours developed, which was 6.4. Increasing this by the coal burned during the idle hours of the engine, it approximates 8. It has been demonstrated that the ratio between the coal burned for operating passenger trains by electric locomotives, rather than steam, is 1 to 2. In a case of switching engines, this rate is



Electric Switching Locomotive; New York, New Haven & Hartford.

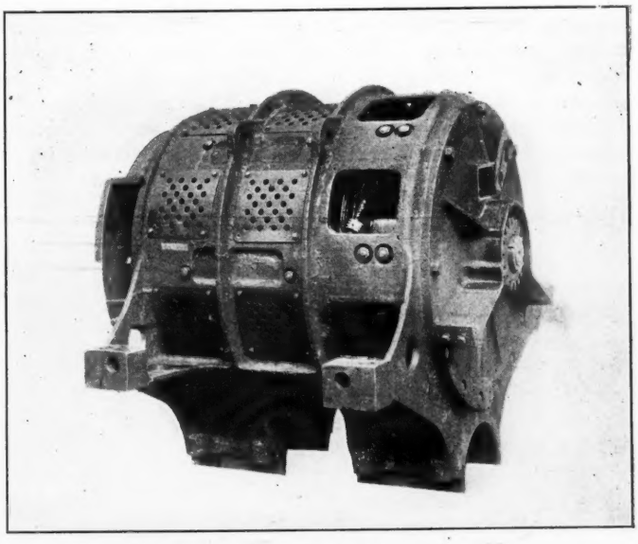
much greater, a figure of 1 to 3 being conservative. This in a measure accounts for the introduction of this new type of electric locomotive.

The new locomotive is a 79-ton, single-phase machine of the articulated truck type, with a central steeple-type cab, the tractive effort being transmitted through the truck frame. The motive power is a quadruple equipment of Westinghouse No. 410, single-phase, double geared motors, with HB (hand operated) Westinghouse unit switch control.

Mechanical Features.—The truck frames are of cast steel, located outside of the wheels and joined at their ends by bumper girders and at the middle of each truck by truck bolsters. The cab has hooded ends and is mounted over center pins so arranged as to relieve the cab structure from draw bar and buffer strains. Its weight is carried by eight spring loaded friction plates. The cab roof and hoods are removable and the motors, air compressor, etc., are arranged for convenient handling. The pedestal jaws in the side frames are fitted with flat shoes. The trucks are strictly interchangeable.

The semi-elliptic springs are of the New Haven standard type, and, as far as practicable throughout the new design the New Haven standard practice for mechanical features has been adhered to.

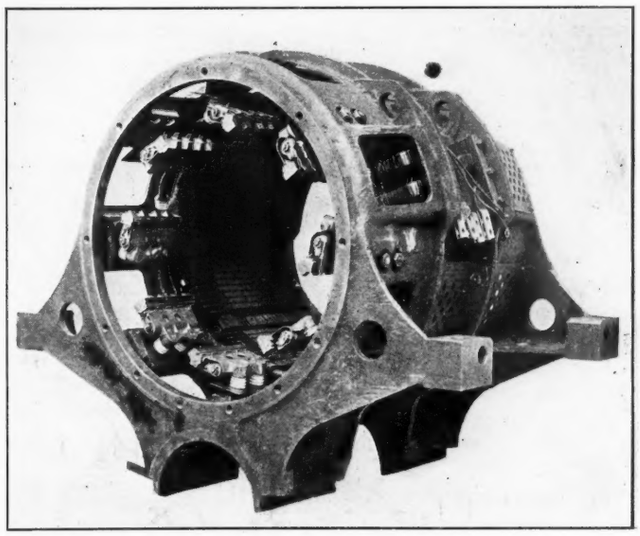
The driving wheels are 63 in. in diameter and are arranged for a flexible spring drive through gears. The gears are



Motor for Electric Switching Locomotive.

mounted on a quill supported in journals carried by the motor frames, the quill having sufficient clearance for the axle movement, similar to those of the New Haven and Boston & Maine "four motor freights." The gear ratio is 17 to 101. The motors are rigidly mounted on spring-borne parts of the frame directly over the axles.

Electrical Features.—The motors, four in number, are for straight single-phase operation on alternating current of 25

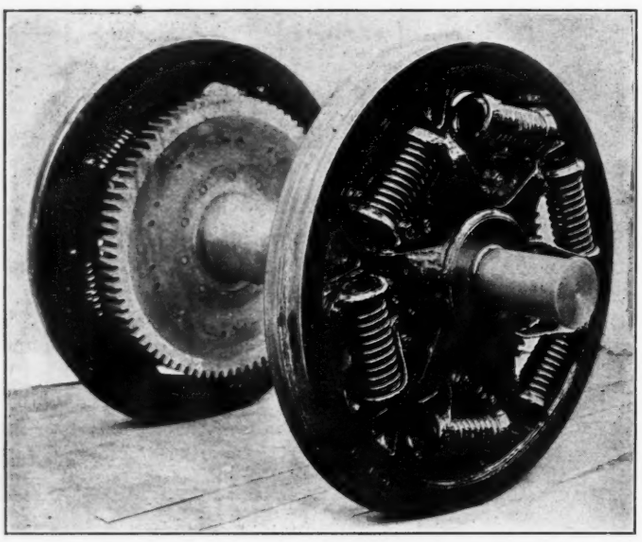


Motor Frame for Electric Switching Locomotive.

cycles and are arranged for forced ventilation. Their hourly rating is approximately 900 amperes at 190 volts, with a continuous capacity of 650 amperes at 190 volts. In general construction the motors resemble the 403-A motors of the Boston & Maine locomotives, but are smaller. Since they are to be used only on the New Haven tracks, provision for operation on direct current is unnecessary; and, while the motor is of

the well-known Westinghouse series compensated type, the compensation is by induction. The compensating winding is short circuited upon itself and is not in metallic connection with the rest of the windings. This type of connection eliminates all voltage strains to ground in the compensating windings, but cannot be used for direct current operation.

The motor frames are of cast steel and the general construction follows Westinghouse standard practice. An electrically operated blower set, located in the hood at one end, furnishes forced ventilation for the motors and materially increases the capacity. The ventilating openings, or louvres, shown in the hood at one end are for the air supply. The control is of the unit switch type, with electro-pneumatically operated switches arranged to connect the motors to suitable taps on a main transformer energized by the 11,000 volt line current is taken from the line by an overhead pantagraph trolley of the New Haven standard type, which with the bell, whistle and sanders is electro-pneumatically operated by push buttons conveniently located on the master controller.



Driving Wheels of Electric Switching Locomotive.

current; and it is particularly flexible for switching purposes. Three starting notches and seven running notches are provided.

The following are the principal weights and dimensions:

Weight of locomotive	158,000 lbs.
Weight on drivers	158,000 lbs.
Weight on each axle	39,500 lbs.
Total length inside knuckles	37 ft.
Rigid wheel base, each truck	7 ft.
Total wheel base of locomotive	23 ft. 6 in.
Diameter of drivers	63 in.
Contract tractive effort	36,000 lbs.
Speed, maximum	26 m. p. h.
Rated horsepower	500
450-ton trains to be handled and shifted in hourly service.	
Weight of each motor, complete with gears, gear cases, quill, and drive details	13,831 lbs.
Maximum armature speed	900 r. p. m.

Reversing is accomplished by two electro-pneumatically operated reversers. All pneumatic switches and reversers are operated by either of two master controllers, one being located at each end of the cab. The control current for the electro-pneumatic systems is supplied by storage batteries.

The running gear, frames, cabs, and mechanical parts were designed by the engineers of the New York, New Haven & Hartford, the Baldwin Locomotive Works, and the Westinghouse Electric & Mfg. Company, and these parts were built at the Baldwin Works in Philadelphia; the air brake apparatus was supplied by the Westinghouse Air Brake Company; the entire electrical equipment was built and the locomotive assembled at the Westinghouse Electric & Mfg. Company's plant at East Pittsburgh. An order of fifteen more locomotives of the same type has been placed.

COUPLER AND DRAFT EQUIPMENT.

The M. C. B. committee on coupler and draft equipment was instructed by the association at its recent convention to prepare a design of a temporary coupler to provide the end-ladder clearance on existing equipment required by the United States Safety Appliance Standards, and submit it to the executive committee, after which it is to be submitted to letter ballot for adoption.

As a matter of information in connection with the requirements of the Federal Safety Appliance Act, which becomes effective July, 1911, the committee calls the attention of the members to the following excerpt from the law:

"No part of car above end sills within thirty (30) in. from side of cars, except buffer block, brake shaft, brake wheel, brake step, running board or uncoupling lever shall extend to within twelve (12) in. of a vertical plane parallel with end of car and passing through the inside face of knuckle when closed with coupler horn against the buffer block or end sill, and no other part of the end of car or fixtures on same above end sills, other than exceptions herein noted, shall extend beyond the outer face of buffer block."

With respect to the equipment of cars in service July 1, 1911, the following extensions are granted:

"(d) Carriers are not required to make changes to secure additional end-ladder clearance on cars that have 10 or more inches end-ladder clearance, within 30 in. of side of car, until car is shopped for work amounting to practically rebuilding body of car, at which time they must be made to comply with the standards prescribed in said order.

"(e) Carriers are granted an extension of five years from July 1, 1911, to change cars having less than 10 in. end-ladder clearance, within 30 in. of side of car, to comply with the standards prescribed in said order.

"(g) Carriers are not required to change the location of handholds (except end handholds under end sills), ladders, sill steps, *brake wheels* and brake staffs on freight-train cars where the appliances are within 3 in. of the required location, except that when cars undergo regular repairs they must then be made to comply with the standards prescribed in said order."

INFORMATION REQUESTED BY M. C. B. COUPLER COMMITTEE CONCERNING EXISTING EQUIPMENT.

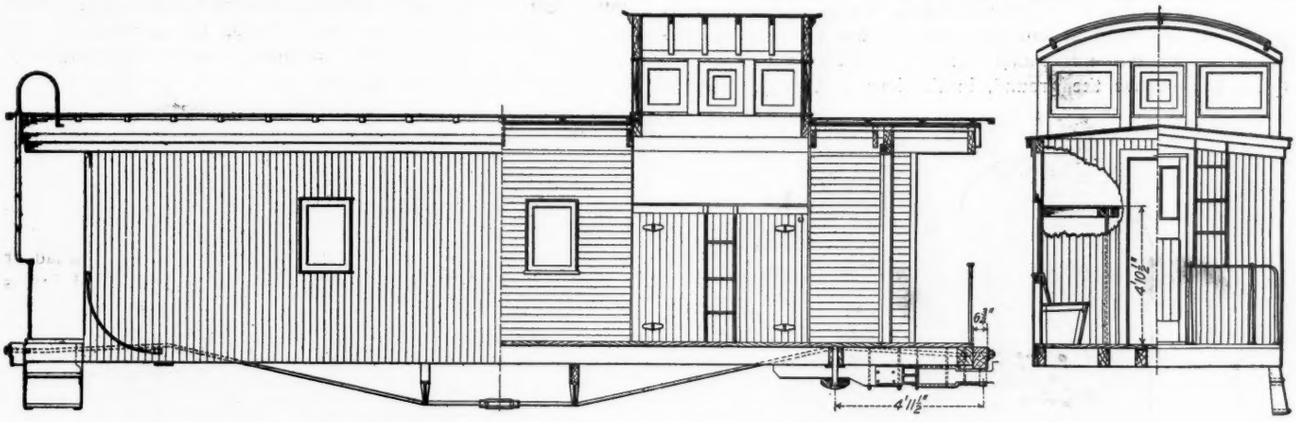
Type of Car.		Number of cars requiring additional end clearance.	Total amount in inches of additional end clearance required.	Inches the head is recommended to be lengthened, based on latest standard of 9¼ in. (See Sheet M. C. B. 23.)
Box and other house	Steel and steel underframe			
	Wooden underframe			
Gondola	Steel and steel underframe			
	Wooden underframe			
Hopper	Steel and steel underframe			
	Wooden underframe			
Tank	Steel and steel underframe			
	Wooden underframe			

In order that the committee may learn the requirements of the various roads, so that a standard temporary automatic coupler can be designed to meet the requirements for end-ladder clearance, the accompanying table is submitted. It is desired that this table be filled out, so that the committee may proceed properly. This subject entails very considerable study, and, therefore, in order to be considered, this information must be in the hands of the committee not later than August 1, 1911. This circular of inquiry is signed by R. N. Durborow (Penn.), chairman; F. W. Brazier (N. Y. C.); C. W. Wildin (N. Y. N. H. & H.); C. H. LaRue (C. R. I. & P.); H. C. Trimyer (S. A. L.); F. F. Gaines (C. of Ga.), and F. H. Stark (Pa. Coal).

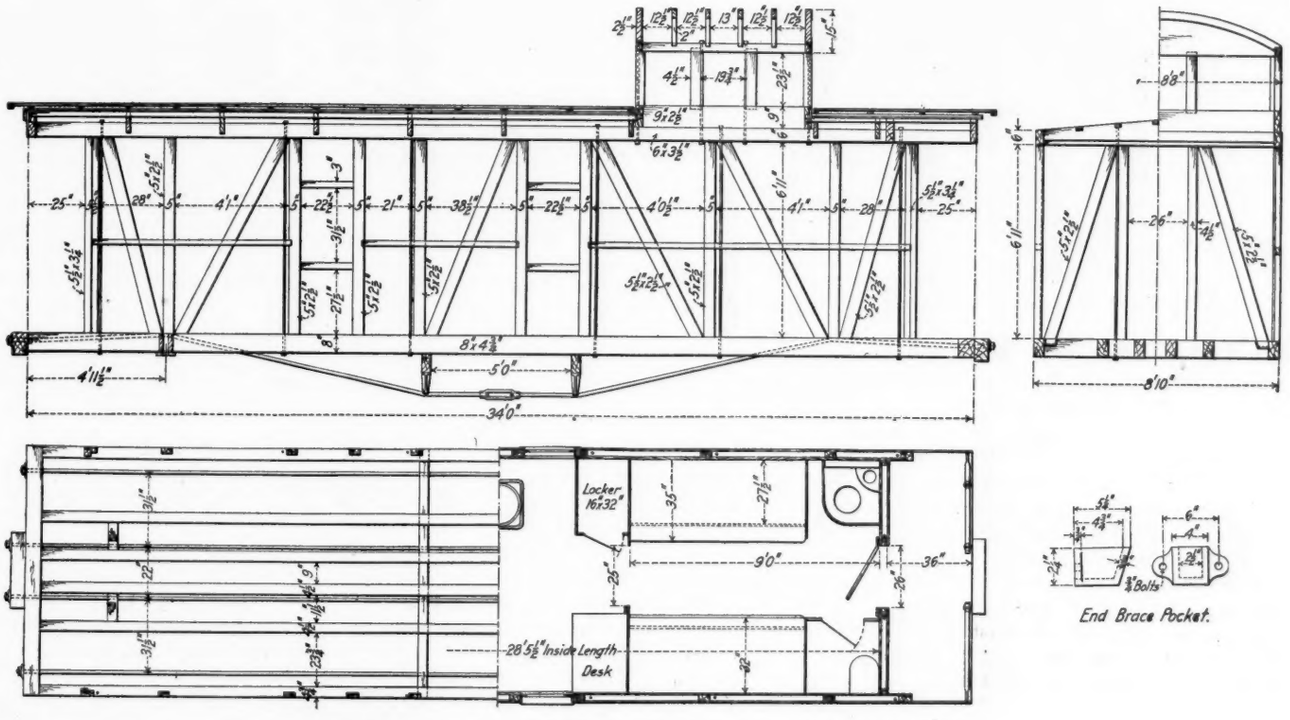
Press dispatches from Santo Domingo, the capital of the Dominican Republic, say that the work on the railway between that city and El Cibao will soon be begun. The contractors of the Sanchez-La Vega Railroad, who will also build this line, have agreed to the government's suggestion to commence the work of construction within the shortest possible time. The works will begin simultaneously at Santo Domingo and at La Gina, near San Francisco de Macoris.

CABOOSE CARS MADE FROM BOX CARS.

The Wabash Railroad has devised an economical way of making caboose cars from 34-ft. box cars, the average cost of the transformation being much lower than the cost of the standard 28-ft. caboose. The drawings show the general construction of these cars. It will be seen that the general superstructure is not greatly changed, the corner and end posts of the box car being set back from the face of the end sill 36 in., providing ample platform room. The center and intermediate sills are 4½ in. x 8 in., and the side sills 4¼ in. x 8 in. The latter run continuously to the end sill, not being cut out for the steps, thus making a simple and strong platform. The side framing is made up of 5-in. x 2½-in. posts and braces, the original construction being altered only by the addition of windows and doors. A roomy cupola is built, rising about 40 in. above the roof, which, with the windows, gives the caboose sufficient light. The lookout platform is 4 ft. 10½ in. above the floor. The car has a head room of about 7 ft., and is equipped with the general furnishings of a caboose, including lockers, seats, bunks, etc. The inside is finished with narrow matched boards laid horizontally. The steps have wrought iron



Elevation and Section of 34 Ft. Caboose Car; Wabash Railroad.

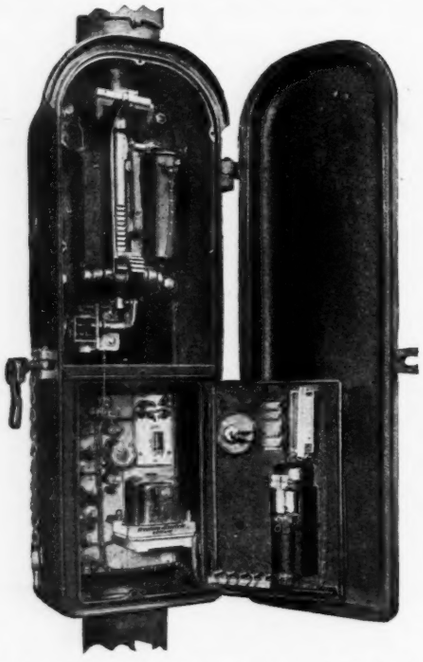


Framing and Arrangement of Caboose Car; Wabash Railroad.

sides, 5/16 in. thick, and 1¼-in. oak treads. For additional comfort to the trainmen, the trucks were altered to give a more flexible action, making the car ride much easier.

SEMAPHORE TO BE OPERATED BY SELECTOR.

The accompanying illustration shows the mechanism of a train order semaphore to be actuated at a distance by selective apparatus, such as is used in making telephone calls, which has been brought out by the Union Switch & Signal Company and the Western Electric Company, acting in conjunction. The semaphore mechanism, the selector instruments and the telephone equipment are all mounted in this one box, which is fixed about 4 ft. above the ground, in the iron post supporting the



Semaphore Mechanism, Selector and Telephone.

signal, being a part of the post. The signal mechanism is contained in the upper part of the box and is covered by an inner door through which projects a handle to be used by the trainman in restoring the signal to the operative position after he has received an order. The selector apparatus gives a distinct answer back after the signal has been put into the stop position. The telephone transmitter and receiver are mounted on the outside of the door of the lower part of the box. All of the metal parts of this apparatus have a black finish.

FOREIGN RAILWAY NOTES.

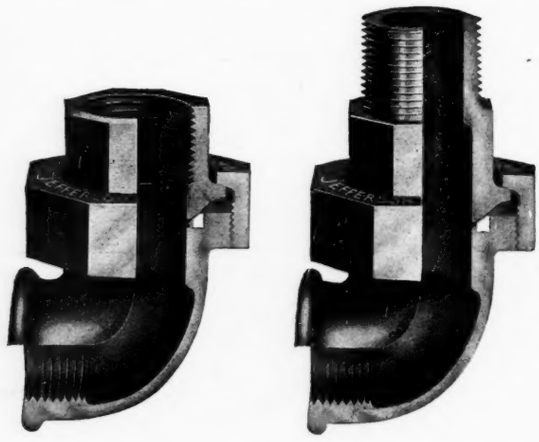
On April 15, 1911, the first station on the Amaga Railroad, Colombia, at Envigado, department of Antioquia, was formally opened. The new depot is located at 5 miles from Medellin.

At the close of 1910 the capital invested in the railways of Argentine amounted to $981,349,000, $874,049,000 of which represented money invested in private lines, and $107,300,000 invested in state railways. On December 31, 1909, the amount invested in the railways of the country was $898,913,000, so that the investment in railways for 1910 represents an increase of $82,436,000. There were at the close of 1910 approximately 15,875 miles of railways in the republic, as compared with 14,840 miles in 1909. It is estimated that the length of the Argentine railways in 1911 will be 16,560 miles. The budget for 1911 carries an appropriation of $11,996,700, national currency, for the development of state railways.

COMBINED UNION AND ELBOW.

Unions and elbows combined which have the strong features of the straight and swing unions, have recently been put on the market by the Jefferson Union Company, Lexington, Mass. These new union elbows are made both all-female, and male-and-female; they save both elbow and expense, and do not require a gasket. The all-female elbow takes the place of two pipe-joints that are somewhat troublesome to make, and three ordinary fittings; namely, a straight union, a nipple, and an ordinary elbow. Better results are obtained when there are fewer joints, as there are just so many less chances for leakage, and with the Jefferson union elbows these joints are reduced. The male-and-female elbow saves three pipe-joints, and takes the place of a straight union, of two nipples, and an elbow. The joints avoided by this combination are even more difficult to make than those for which the all-female elbow is a substitute.

With these union elbows absolute alinement of the elbow and pipe on the two sides of the elbow is not required, no matter which style of union is used. The Jefferson ground spherical brass-to-iron joint is used, which is relied on to make a tight



Jefferson Union Elbows.

joint without the use of a gasket. In addition, there is a large amount of play between the nut of the union and the swivel end, making the union easy to apply even when the alinement is not exact. The construction of the nut, and its adjustment to the swivel and the brass seat ring, are the special features peculiar to Jefferson unions. The brass ring is turned from seamless brass tubing, so as to be free from the blow holes and imperfections, which may occur in cast metal. The Jefferson ring sets in a recess away from the runway of the pipe, with an iron wall on each side, and is thus secured against loosening on account of the difference in the expansion and contraction of the iron and brass.

The pipe ends are made of malleable iron, which will not stretch, and they are threaded with Briggs standard taper pipe threads. The nut threads are coarse enough to allow of rapid adjustment, and as they are coated with graphite, both for lubrication and to prevent their corrosion, the union may always be easily disconnected after it has been in use. The Jefferson Union Company is prepared to furnish both 90-deg. and 45-deg unions.

A railway is soon to be built from San Juan, Bolivia, to the town of Jachal. The route is through one of the most fertile portions of the province of San Juan, while the town of Jachal, situated on the Jachal river, is an important wheat-producing and milling center. In the neighborhood there are extensive areas which are devoted to grape culture and the production of barley, cotton, and flax.

Maintenance of Way Section.

THE competition on Bridge Kinks, which closes August 1, should interest all having to do with the maintenance of such structures. This contest includes all methods of handling problems commonly arising in making repairs or renewals of either timber or permanent bridge structures, and the judges will give special attention to those contributions describing methods or devices capable of general application. A first prize of $25 and a second prize of $15 will be awarded the best two contributions, and all others published will be paid for at our regular space rates. All contributions must be in the hands of the Civil Engineering Editor of the *Railway Age Gazette,* 417 South Dearborn street, Chicago, not later than August 1.

WHILE the importance of the general subject of track drainage has been recognized of late years, the best methods of providing drainage, especially in the more difficult cases, are not so well understood. One can see many instances of money being spent year after year in an endeavor to maintain track in good condition, where, if but a portion of the expenditure made were properly applied on drainage, the defects that cause the trouble would be permanently remedied. Again, in many cases the problem is given up as hopeless after one or perhaps two methods have been used without success, while the difficulty may be that the remedy properly suited to the particular case has not been tried. No one method of drainage can successfully be applied to all varying conditions. Certain methods are best adapted to certain conditions, but are not effective under other conditions. The *Railway Age Gazette* desires to draw out different methods of successfully draining wet embankments or cuts, and announces a "Drainage" contest. This contest will include all methods of handling different track drainage problems, and special attention will be given those methods capable of the widest application. All contributions should clearly describe the local conditions before the drainage was undertaken, as well as the method adopted in detail. If other methods were tried before one was found effective, the reasons for the failures will be instructive. Prizes of $25 and $15 will be awarded for the best two contributions, while our regular space rates will be paid for all others accepted for publication. All contributions must be in the hands of the Civil Engineering Editor, *Railway Age Gazette,* 417 South Dearborn street, Chicago, not later than September 1.

NINETEEN contributions were received in the contest on "How the Roadmaster Can Promote Efficiency," which closed July 1. The judges, H. G. Hetzler, president of the Chicago & Western Indiana, H. J. Slifer, general manager of the Chicago Great Western, and E. P. Bracken, assistant general manager of the Chicago, Burlington & Quincy, all of whom are practical track men and careful students in this field, went through the papers very carefully and awarded the first prize to J. W. Foote, division engineer, New York, Susquehanna & Western, and the second prize to Robert H. Orwig, supervisor of the Cumberland Valley Railroad, Chambersburg, Pa., both of whose papers are published in this issue. Other papers were submitted by: E. R. Meredith, supervisor P. & R., Coatesville, Pa.; F. M. Patterson, assistant engineer C. B. & Q., Chicago; J. F. McNally, assistant superintendent A. T. & S. F., Chanute, Kan.; S. B. Peter, roadmaster St. L. & S. F., Pittsburg, Kan.; B. A. West, roadmaster A. T. & S. F.. Pueblo, Colo.; W. G. Dungan, roadmaster C. B. & Q., New Orleans, Neb.; M. Ganley, roadmaster A. T. & S. F., Argentine, Kan.; W. H. Kofmehl, roadmaster C. M. & St. P., Elgin, Ill.; D. C. Lawton, division engineer A. T. & S. F., Newton, Kan.; J. Burns, roadmaster Michigan Central, Bay City, Mich.; B. James, supervisor C. & E. I., Marion, Ill.; G. LeBoutillier, division engineer Pennsylvania, Cincinnati, Ohio; F. W. Rizer, assistant engineer C. B. & Q., Chicago; J. A. McRae, refrigerator inspector, Union Pacific, Grand Island, Neb.; R. P. Trabue, roadmaster N. C. & St. L., Nashville, Tenn., and J. E. Crabbs, roadmaster C. & N. W., Chicago; and will be published in this and succeeding issues. The contest was very successful, and brought out a large number of very good ideas of practical value to men concerned in track work.

THE point made in one of the papers submitted in the efficiency contest and published this week, that section foremen should be encouraged to cultivate the acquaintance of and amicable relations with the farmers along the line, deserves to be emphasized. The importance of the influence of the section foremen, both in promoting friendly relations with the adjacent farmers and in securing traffic, are not fully realized, and largely for this reason their indifference toward the railway's neighbors has been allowed to increase. In making an inspection over his line recently, in which he took the foremen with him over their respective sections, a prominent officer of a western line asked the different foremen who owned the land adjoining the right-of-way at numerous different points, and in but one instance, in a trip of about 1,200 miles, did he find a foreman who was thoroughly acquainted with the land owners. By taking proper preventative measures and at the same time securing the co-operation of the farmers for the purpose of warding off fire, overflow and livestock claims, the section foreman can gain far more results for the company than can all the claim agents on the road after claims are filed. The good will of the farmers immediately adjacent to the right-of-way is dependent more on their relations with the section foremen than on their acquaintance with the station agents or other employees. The influence that the foremen may exert in securing business for the road is well emphasized by the following letter, recently sent out under the head of "Cultivation," by the general manager of the Chicago Great Western to the section men and bridge men along that line: "More than any other class of employees, you have the opportunity of close contact with the farmers, who are producing today that which means tonnage, and therefore revenue for the railway company, tomorrow. Have you ever thought of cultivating the farmer while he is cultivating his fields? A friendly chat over the fence, a wave of the hand as you pass by, may mean a shipment of corn or cattle—just because you were interested in him. For your company's welfare, as well as for your own sake, cultivate the farmer!"

THE general manager of a large Western road has just completed an inspection trip over his entire system, on which he stopped to talk with each section foreman personally about his work and to encourage him to maintain his track to the best possible standard. In his conversations with the foremen he impressed on them the idea that they are a responsible part of the railway organization, and that efforts towards economy on their part are fully as important as in any other department; and he assured them that for each five cents per day each of them saved the company their general manager would save for it an equal amount. Such talks will undoubtedly accomplish savings for the road, not merely by impressing on the men the necessity for care, but by establishing a spirit of common interest between them and the higher officers, and thereby causing them to take increased interest and show more loyalty in their work. Any foreman can save the company a nickel a day if he will try, and he is much more apt to try when the higher officers stop their trains occasionally to talk with him about his work than when they go by at full speed. The work of the track foreman is at best monotonous. He ordinarily comes in contact with no superior officer other than the roadmaster and the division engineer, except, possibly, occasionaly the division

superintendent. This state of affairs naturally results to a certain extent from the growth of a road; the duties of the higher officers are so increased that they cannot meet the men personally as they used to without making a special effort. But just as soon as the employee loses this contact with his superiors he tends to lose his personal interest in his work; and when he loses this he becomes a mere part of the machine and he does his work mechanically and with a great loss in efficiency. The day when the section foreman spoke and thought of the road as his road is probably gone for good; but a partial return to the state of affairs when he comes in closer contact with his superiors will materially increase the loyalty and efficiency of this class of employees. The example of the general manager referred to above might be followed generally with beneficial results.

ANY plan involving an increase in pay for track labor is apt to encounter opposition from railway managers, and unless a radical change be made in selecting such labor this opposition is fully justified. Under present conditions a flat increase for all track labor would very likely result in no increase in efficiency. But if track work should be classified between skilled and unskilled—in other words, as semi-skilled—labor, and a schedule of wages should be made, based on this distinction, it is possible that there could be secured for it a class of workmen that cannot be obtained at prevailing wages, but that would be worth the increased rate necessary to get it. For instance, if a small extra gang was able to do the more careful and difficult track work, such as handling frogs and switches. and its members were given to understand that their chance to earn the increased rate was contingent upon good service, it is believed that good results would be obtained. English-speaking men should be selected for such a gang, and it could be utilized as a training school from which to supply foremen. The practice of the Union Pacific in maintaining a "school gang" illustrates the point. If a good class of men cannot be obtained locally, the gang could be recruited from the regular extra gangs, this being held out as an incentive for the more ambitious. The average roadmaster is pessimistic as to the worth of the foreign laborer, and does not fear that the waiting list from this class will be overcrowded. It is probable that the Italian and Greek will always be with us in track work, but it is not at all certain that they will ever become as proficient in those parts of it requiring skill and judgment as the English-speaking men they have displaced. There is, on the other hand, almost a certainty that these foreigners are not the material from which the best foremen, supervisors and roadmasters are made. If they are to be used only for such work as they are capable of doing—work that is not attractive to the intelligent laboring man—the rate of pay of the semi-skilled workman should be based on his efficiency as compared with the Italian. If in this way 50 per cent. more efficiency could be secured for an increase of from 25 to 35 per cent. in wages it certainly would not be a bad investment. It is at least worthy of a careful trial.

CONTEST ON COST DATA.

IN the past the roadmaster or supervisor who was able to maintain the best riding track was considered the most efficient. The cost incurred was but little considered. The tendency now is to consider, as the most competent, the man who can maintain the track in the best condition with the minimum expenditure. The old roadmaster's success in maintaining good track depended very largely on his being able to secure from his superior officers, by legitimate arguments, what he considered an adequate amount of track material; or, not uncommonly, on the more questionable method of appropriating to his maintenance work material as well as labor intended for authorized construction work. It has been a frequent co-incidence for maintenance charges to be unusually low during and immediately following a large amount of heavy construction expenditures, for which only one explanation is possible.

With the increasing appreciation of the value of knowledge of the cost of work, one is somewhat surprised to find the absence of detailed cost data regarding maintenance. Less cost data has been kept in the track department than in any other department of railway operation, and it is largely for this reason that track work has been so expensive. Operating officers, who have approximate transportation costs at their finger tips, can only guess, in an indefinite way, at the cost of putting in a switch or tamping a tie. There is the same lack of definite data among those directly in charge of maintenance work, which largely accounts for the high and widely varying unit costs. When one does not know the unit costs of his work, and does not have this feature impressed on him, he will not spend such time endeavoring to reduce them. It is only when he sees such data in front of him and his attention is called directly to it that he studies it. To be of value, this data should be kept closely up to the work, so that the officer in charge can know what it is costing while he is actually doing it. It does a roadmaster very little good to learn some time during the winter what his tie renewals cost him the preceding June. At the same time, to be practical, this data should be compiled in a way to require a minimum of clerical work and consequent expense. The method described by Mr. Dungan in this issue is giving good results under the conditions under which he is using it.

We desire to learn the extent to which the keeping of cost data is carried on, and also the extent to which the data is furnished the men on the work. To secure this information, we announce a contest on "Methods of Keeping Cost Data in Maintenance of Way Work." This competition will include all methods of keeping cost data in maintenance of way work and getting it before the men who are doing the work. The plan should be given in detail as well as the results secured, and the amount and cost of clerical work involved should also be given. A first prize of $25, and a second prize of $15 will be awarded the best two contributions, while we shall pay at our regular space rates for all other contributions published. All contributions must be in the hands of the Civil Engineering Editor, *Railway Age Gazette,* 417 South Dearborn street, Chicago, not later than October 1.

THE FUNCTION OF THE EXTRA GANG.

ONE of the most perplexing problems the engineer or roadmaster in charge of track work has to solve is the determination of the proper use to be made of the extra gang. This problem is continually growing more complex as the supply of labor for extra gangs is so rapidly changing from native to foreign. "In the good old days" the extra gang laborer was the aristocrat of the track. This cannot be said today. Too often now the extra gang is regarded as an evil. But, if an evil, it is still very often a necessary one. The problem is to use it to the best advantage, where it must be used at all, and to so arrange the work as to do without it in many cases. While local conditions of course govern the amount of work which can be done by section forces, much which it was formerly considered necessary to do with an extra gang is now done by increasing the section forces, and still other work can be done to advantage in this way.

It will be conceded that relaying of rail requires the use of an extra gang, as does also the first raise in heavy reballasting work. On the other hand, if enough satisfactory men can be secured for section forces the final raise in ballasting and the dressing up of the track can, many times, be done to better advantage by a section gang. In the first place, the extra gang foreman is mainly interested in surfacing as many feet of track per man per day as is possible, for he knows that his output is watched. Under such conditions it is not to be wondered at if he sacrifices thoroughness to speed, especially as he is not held responsible for the track after his gang has left it. The very nature of an extra gang makes it impossible to get uniform results. With a large gang it is impossible to watch the tamping as care-

fully as should be done. On the other hand, the section foreman with a smaller gang can pay close attention to the tamping and, having men who are more permanent, he can teach them to do this tamping in a thorough manner. Such foremen should insist upon and teach their men to do the tamping uniformly, for if one tie is tamped less than another swinging track and bad surface will soon develop. A section foreman has every incentive for seeing that the work is done well, knowing that slipshod methods will result in trouble for himself in the end. If the first raise has been made to a good surface it will be a help rather than a detriment if the finishing gang does not follow too closely for the delay will give the new ballast a chance to settle, and when the final raise is made it will be on a good foundation.

The proper size of the gang for the work to be done is not in general given the attention it should receive. Too often extra gangs are formed of the same size regardless of the class of work they are intended for. A careful study should be made of the number of men required for any particular class of work. For instance, in planning on a steel gang the number of men should be so arranged that all parts of the work will move at the same speed, and no one group should either be delayed waiting for men ahead of it to get out of the way, or be allowed to kill time waiting for others to catch up. Too few or too many men in a gang cause an economic waste. In very many cases no distinction is made between the size of steel and ballast gangs in sending out men, although to secure the best results the ballast gang should be smaller than the steel gang. In handling ballast there are not as many details to be handled in sequence requiring the splitting up of the gang, and the amount of supervision necessary is much greater.

The efficiency of a ballasting gang, especially if composed of foreign labor, is very closely dependent upon the supervision of the foreman, and, as a rule, the larger the gang the less are the results per man. A careful study of the proper size of the gang for different classes of work should enable a roadmaster or a supervisor to effect material reduction in his unit costs, and the subject is worthy of the most serious consideration.

ENGINEERING ARTICLES SINCE JUNE 16.

THE following articles of special interest to engineers and maintenance of way men, and to which readers of the engineering and maintenance of way section may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since June 16:

Missouri, Kansas & Texas Freight House at St. Louis.—The structural details, the mechanical devices for handling freight, and the method of operation of the new freight house at St. Louis, which represents the most advanced practice in the mechanical handling of l. c. l. freight, were described in an illustrated article on page 1647 of the issue of June 23. An editorial on the operation of this plant on page 1643 of the same issue.

Engineering Education.—Review of the proceedings of the 18th annual meeting of the Society for the Promotion of Engineering Education. June 23, page 1645.

The standard of maintenance on American railways as affected by the wage increases for the past 18 months was commented on editorially on page 1677 of the issue of June 30.

The Madeira-Mamore Railway.—P. H. Ashmead, who was chief engineer of the Madeira-Mamore Railway from 1908 to 1910, gives a brief history of this project and a description of the interesting engineering features connected with the building of a road under peculiarly difficult conditions. June 30, page 1684.

Ratchet Track Wrench.—The National ratchet track wrench was described and illustrated on page 1700 of the issue of June 30.

American Society for Testing Materials.—The report of the 14th annual meeting of the American Society for Testing Materials, held June 27 to July 1, appeared on page 7 of the issue of July 7. The report of the convention was commented on editorially on page 3 of the same issue.

College Men and Railway Engineering.—The advantages and disadvantages of railway engineering for the young graduate are commented on by one of the "Class of 1903," in a letter to the editor, on page 71 of the issue of July 14.

Oregon-Washington Railroad & Navigation Company's Portland Bridge.—The details of the substructure and superstructure and of the operating machinery of the new double deck lift bridge which the Oregon-Washington Railroad & Navigation Company is building over the Willamette river in the city of Portland, Ore., are described in an illustrated article in the issue of July 14, page 77.

THE USE OF RAIL ANCHORS.

The subject of the creeping of rails is not a new one, but the best means for preventing it is a very live question with railway maintenance of way officers today. It is the general opinion that the development of the best device or method for stopping creeping is still in an experimental stage. The tendency toward creeping is increasing, because of the disproportionate increase of the weight of motive power and equipment as compared with that of the track itself. For this reason, even on the best maintained roads, some device is necessary to stop the movement of the rail. Evidences and results of creeping can be seen on most track, for while some form of rail anchor is used on all important roads, with three or four exceptions, in many cases the devices used are not so arranged, or so placed, that it is possible to get the greatest practicable benefit from them.

CAUSES OF RAIL CREEPING.

The creeping of rail is the result of a wave action set up in the rail during the passage of a train. Being in sections, 30 or 33 ft. long, the rail does not act as a continuous beam which would back into place after the passing of the train, but each section, to a large extent, acts independently of the others, adjusting itself at the splices. This creeping is much intensified

Ties Bunched and Ballast Piled Up.

where the joints are not bolted tightly, while at the same time if the bolts are tightened so as to prevent any movement or adjustment, the stresses exerted in the rail are much intensified. The tendency of the rail is to move forward with the train, while the amount of creeping depends very largely on the condition of the roadbed and track. The more solid the roadbed, and the heavier the track structure, the less is the creeping. A heavy rail laid on good ties with plenty of good ballast in the track will resist a strong tendency toward creeping, while under the opposite conditions of light rail with little or no ballast, and with a heavy traffic, the rails will move very much. The amount of creeping also depends very largely on the condition of the roadbed. It is greater on embankments than in cuts, and it is especially marked on soft embankments across marshy ground. In some instances in the muskegs of Canada this movement reaches several inches with the passage of a single train.

Creeping proceeds in the direction of the heavier traffic, and for this reason is much greater on double track, where the traffic is all in one direction, than on single track, where the tendency to move in one direction is resisted by the traffic in the opposite direction; and, other things being equal, only the net balance of traffic affects the movement of the rail. For this reason it is very often necessary to adopt measures to prevent the creeping of the rail following the construction of a second track, where previously there had been no tendency to move. Other conditions being equal, the movement on single track will usually be down grade, while on double track this movement

is increased on a descending grade, owing to the faster speeds on the descending grades and to the more frequent application of brakes. In some cases, on a single track, the rail creeps up grade for some distance from the foot of the hill, owing to the high speeds at which the trains travel in making a run for the hill. The outer rails on curves usually move more than the inner rails, owing to the greater pressure exerted on the high rail, although the lower rail frequently moves the most when the elevation of the curve is too great. One sometimes finds that one rail creeps one way, while the other creeps in the other direction, although when this occurs it can usually be attributed to the presence of curves turning in opposite directions at the ends of the stretch under observation. An example of this occurs at the bridge over the North Platte river on the Union Pacific at North Platte, Neb., where the north rail moved west and the south one east, until anchors were applied recently.

Creeping is greatly increased during hot weather. At this time the rail is highly stressed, owing to the expansive action and the additional stress resulting from the movement of the train. This latter load is quickly applied and acting in one direction provides sufficient force to start motion in that direction, which, once started, affords relief from the expansive stresses as well. Another reason for the increased creeping in summer over winter is that in winter the roadbed is frozen

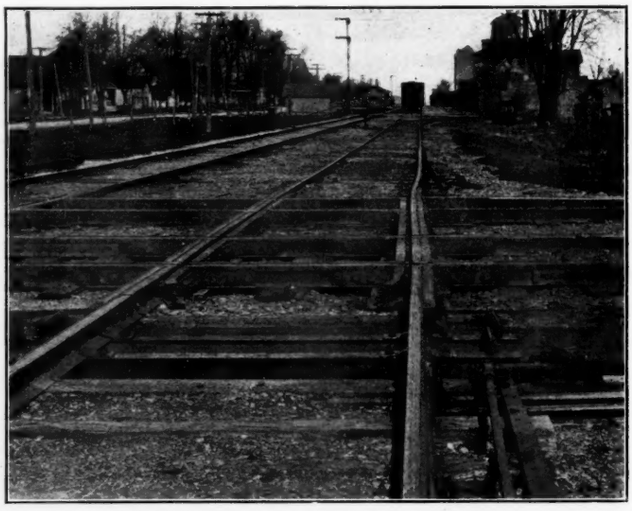
Kinking of Track at Switch; Six Months After Adjustment.

and affords a more solid foundation. Excessive creeping usually occurs early in the spring, when the ground thaws and the rail is released from the frozen grip of the ties and roadbed.

RESULTS OF RAIL CREEPING.

The results of rail creeping become serious in several ways. In the first place, such movement renders useless the measures taken to secure the proper expansion when rail is laid, as all openings are closed up. Then, when the rail expands from the heat there is no opportunity for adjustment and the only relief is to buckle. Where the heat is severe it is necessary to drive the rail back frequently in order to maintain sufficient expansion. This work is very laborious and expensive, and the worst feature of it is that the relief secured is but temporary, and that the remedy must be continually repeated. A great part of the track work in the South in summer, where careful measures are not taken to prevent creeping, is due to this one cause.

The most general source of trouble caused by rail creeping is the pushing of ties out of line and the bunching of them, which is illustrated in one of the accompanying photographs. With the joints and angle bars now generally used, the practice is to slot-spike the joint ties. Any creeping of the rail drags these ties off their bed and makes a low joint. Rail can creep but a short distance before it becomes necessary to straighten and respace the ties as well as to tamp them up carefully. A danger which must be guarded against with the dragging of the ties



Crossings Dragged Out of Line; Seven Months After Being Lined.

is that of tight gage, which naturally results from the sloughing of the ties.

The common effect of creeping at switches is kinking of the track at the points, as illustrated in one of the photographs. A great deal of trouble is often met at crossings, especially if one or both lines are double track, the tendency being to drag the adjacent crossings out of line in opposite directions, and in this way double the effect in rough-riding track. This is clearly shown in an accompanying illustration. Radical measures are often necessary to arrest all movement at interlocking plants and drawbridges where any small movement of the rails throws all adjustments out.

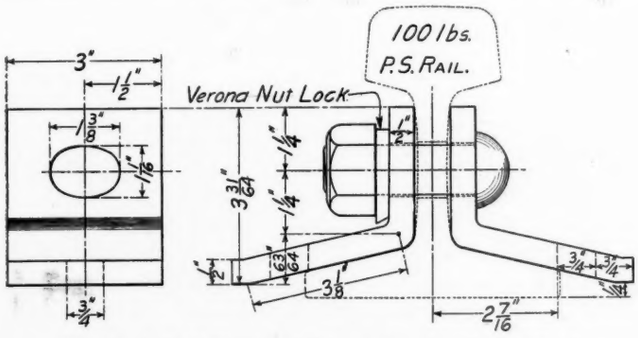
The extent to which the rails should be anchored on bridges or trestles is a somewhat disputed question. In such places the tendency to creep is excessive, for here there is greater vibration than on a solid roadbd. Most roads allow the rail to move freely on trestles and concentrate their efforts to stop this movement on the embankments at either end, fearing that if the movement be but partially stopped on the trestle it will pull the structure out of line. On the other hand, if enough anchors are placed on the trestle to stop all movement the result will be greater security against damage, for if the rail is allowed to run freely an occasional tie will be pulled out of line, owing to tight spiking, even though the joint ties are not slot-spiked. One large road is this year beginning the practice of placing anchors on all trestles.

ECONOMY IN USE OF ANTI-CREEPERS.

It is quite generally agreed that a device which will stop rail creeping will reduce the expense of maintenance very materially. The cost of spacing the ties occasioned by it alone reaches a large amount in the year, as does the increased attention and work required at bridges, crossings and interlocking plants. On one important double track line of the Chicago, Milwaukee & St. Paul the records show that required an expenditure of from

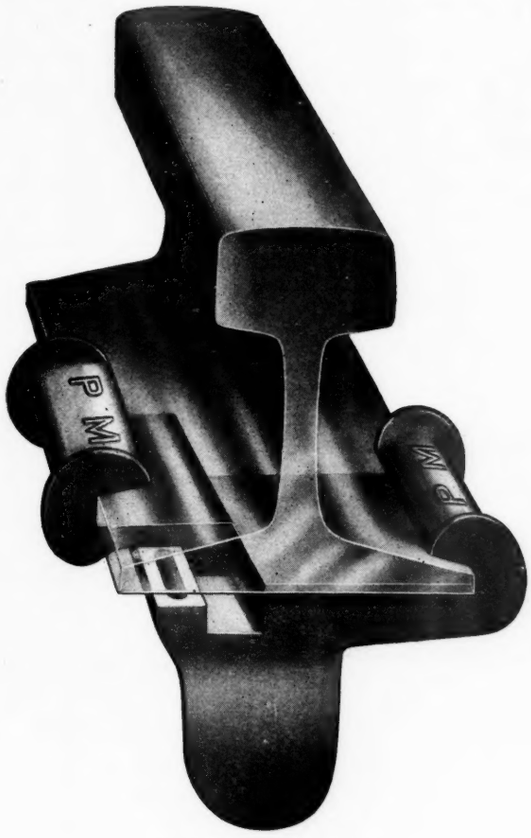
$100 to $200 per mile per year to readjust the position of the joint ties which had been forced out of place by the creeping of the rail, in addition to the extra labor required to maintain the track in proper surface. Another large road estimates that about 20 per cent. of its track labor on sections where creeping is evident, is employed in overcoming the effects of rail creeping.

Where the rail is inclined to creep it is economy to put on



Standard Anti-Creeper; Pennsylvania Lines West.

enough anti-creepers to arrest the movement entirely. With the more common arrangement of staggered joints these anchors should first be placed on the ends of the joint ties opposite the joint in order that the tie may be kept in line. Frequently this will stop the creeping, but with more serious cases further anchors should be placed at the quarter points, care being taken to see that both ends of the same tie are anchored. In espe-



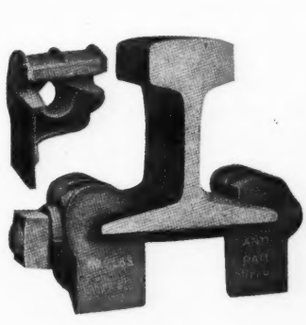
P. & M. Anti-Creeper.

cially bad places it is sometimes necessary to place eight or ten anchors on each rail. On a stretch of track on the New York Central between Rome, N. Y., and Greenway, and also in the Oriskany swamps between Rome and Utica, the tracks formerly crept from 5 to 12 ft. in a year. At these points it was necessary in some instances to place five or six anchors per rail before the movement was stopped.

In all cases the origin of the creeping should be found and anchors placed at such point to arrest the movement at the start rather than attempt to stop it at some distant point where its effect has been noticed. For instance, an attempt should not be made to arrest the movement of rail running down grade by placing sufficient anchors at the foot of the grade to stop the movement at this point, for the natural tendency then will be for the track to buckle above the anchors. On the contrary, sufficient anchors should be distributed from the top of the grade down to overcome the tendency towards creeping as it arises.

REQUIREMENTS OF SUCCESSFUL RAIL ANCHORS.

A large number of devices have been designed to stop rail creeping. With a desire to find out how many of these are being used, and the results being obtained from their use, the *Railway Age Gazette* sent a letter to some 20 leading roads of the country, asking what anchors they had used and the results secured, believing that the publication of this information would be of benefit to all men studying this subject and would enable them to see what anchors are standing the tests of actual service. At the present most of the roads are experimenting to a greater or less degree with most of the anchors on the market, and the results of the trials already made will, it is believed, be of value to others who are beginning to study the subject.



L. & S. Anti-Creeper.

Q. & C. Anti-Creeper.

In addition to being able to stop creeping, the requirements for a rail anchor are:

That it should be economical in first cost.

That it should be easily applied.

That it should be strong enough to withstand the stresses placed upon it.

That it should be simple in construction, with few parts to break or become loose.

That it should require the minimum attention.

It is also necessary that the device grip the rail firmly at all times and not loosen if the pressure against the tie is released and the rail creeps backward a little. It frequently happens that the contraction of the rail during the night or the reversing of traffic will draw the anchor back a little from the tie. Under such conditions certain anchors—although satisfactory while bearing directly against the time—lose their grip and fail to grasp the rail when it again moves forward, or loosen and fall off. The consensus of opinion seems to be that there is not now any device which entirely fulfills all these requirements, although some more nearly do so than others. There is no track appliance which is so apt to be neglected as the rail anchor, and for this reason there is a growing demand for such development of these devices as will make them nearly self-maintaining.

In using any rail anchor, and, in fact, any device on the track, care should be taken by the officers in charge to see that it is properly applied. In most instances, new devices are sent out to the roadmaster, supervisor or foreman without any directions as to their application and with no one to show them how to

apply them. As a result, many times the device is put on wrong and in a short time a failure is reported, when, as a matter of fact, the fault is with the method of handling rather than with the device. As a matter of economy, a road can well afford to maintain an inspector to instruct the trackmen how to use and maintain the different new track appliances, whether they are being tried experimentally or have been adopted as standard; for the gain in results from these devices, in which the money has already been invested, will pay the inspector's salary several times over. Some roads have adopted this plan, but it should be a more general practice. In some cases the supply firms have put on inspectors of their own, who endeavor to be on hand whenever any of their appliances are being put in service, the frequent turning of an unfavorable report into a favorable one justifying the expense.

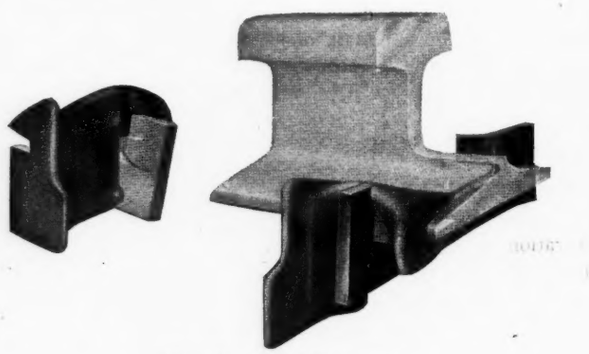
TYPES OF RAIL ANCHORS.

Probably the simplest form of rail anchor used is the section of an angle bar bolted to the rail. Old angle bars are cut up into lengths varying from 3 to 5 in., and are slotted for spikes and drilled for bolts. They are fastened, one on each side of the rail, the same as an angle bar, and are slot-spiked to the tie. They possess an advantage over the other devices in that they are low in cost of maintenance and require but little attention, although they become noisy unless the bolts are kept tight. They possess an added advantage in that they will retard creeping in either direction. The serious objection to them is the cost of application. The rail has to be drilled on the track, for the bolt, which is a slow and expensive job, frequently costing alone as much as some other anchors. With the more general use of open hearth rail, the cost of drilling is greatly increased and is in many cases resulting the abandoning of this type of anchor. Also, when once the rail is drilled the location of the anchor is permanently fixed while other anchors may be placed at any point bearing against any solid or well tamped tie. Some men object to this device on account of the weakening of the rail

Positive Rail Anchor.

section caused by the drilling of the hole in the web, the short section of angle bar not adding any definite strength This device is used on a number of roads, among which are the Chicago, Burlington & Quincy and the Great Northern, while the Missouri Pacific uses a special section very similar to this at points where the rails are creeping in both directions. The Pennsylvania Lines West also have a standard section of this type—illustrated herewith—which they find gives results equal to those of any other creeper, although it is, of course, more expensive.

The patented anchors may in a general way be grouped into two classes, wedged and bolted, depending on their method of securing their grip on the base of the rail. The earlier anchors were largely of bolted types, but several of these have been withdrawn from the market, and the reports we have received indicate that there are now but two or three such types in use, it being complained that the bolts in most of such anchors are hard to keep tight. For this reason they require careful inspection and maintenance. As with any bolt in the track, constant passage of trains tends to loosen them, and when one becomes loose the grip on the rail is lost. There is also difficulty frequently in tightening the bolt where brine drippings fall from refrigerator cars.



Vaughan Anti-Creeper.

One of the widely used anchors is the P. & M., a two-piece device of the wedge type which engages the outer edges of the base of the rail, the pressure against the tie increasing its grip on the rail. It is simple to install, and when once properly placed the percentage of failures is low. Among the roads using it are the New York Central, the Michigan Central, the Missouri Pacific, the Santa Fe, the Louisville & Nashville, the Burlington and the Illinois Central. Out of the total number of roads reporting, representing over 63,000 miles, good results were reported on this anchor from 49,000 miles.

Another widely used anchor is the Vaughan, also of the two-piece wedge type. This consists of a yoke extending under the base of the rail, with only one end reaching over the base, while the other engages in a slot in a shoe which rests against the tie. The movement of the rail forces the anchor at an angle with the rail until it grips it securely. A successful use of this anchor is reported, among other lines on the Missouri Pacific and the New York Central lines. Out of the 63,000 miles covered by the reports, over 15,000 miles reported favorably on the anchor.

Still another wedge anchor is the new Positive. In this design a number of changes have been made over a previous anchor of the same general type. This is a one-piece anchor and secures its hold on the rail by gripping the top and bottom of the base of the rail rather than the edge. While the new design has been on the market only a few months, and no conclusive opinion as to its merits can be obtained at this time, the results from roads covering 12,000 miles, show that it is satisfactory so far.

The Dorpmueller is a German anchor used to some extent in this country, but is composed of several pieces and is more complicated. It has been used with good results on the New York Central and the Missouri Pacific.

Of the bolted anchors the L. & S. and the Q. & C. are practically the only ones still being used to any great extent. The L. & S. consists of two bearing surfaces facing against the tie on opposite sides of the base of the rail and held in contact with the rail by a bolt. It is used extensively on the C. M. & St. P., where it has proved satisfactory, where it has been given proper attention. Roads representing 15,000 miles reported favorably on the L. & S. anchor. The Q. & C. has one bearing surface against the tie and is fastened to the rail by a hook bolt. Good results were reported for this device on roads representing 11,000 miles of track, including the Missouri Pacific and the El Paso & Southwestern.

ROADMASTERS' EFFICIENCY COMPETITION

FIRST PRIZE—MAINTENANCE OF WAY EFFICIENCY.

BY J. W. FOOTE,

Division Engineer, N. Y. S. & W., Jersey City, N. J.

The investigation and successful experiment of Frederick W. Taylor, Frank B. Gilbreth, and others of the same school of practical and scientific economy, have called the attention of thinking people to the possibilities of very large savings when work is handled scientifically. While the iron and brick trades have profited by their efforts and other industrial trades have been systematized, practically nothing has been done in the maintenance of way departments of railways to arrive at a standard basis of practice and standard units of cost. The operation of trains has been charted and definite results determined on a scientific basis and shop work has been improved scientifically, but the track work, which is really one of the largest items of expense that our railways have to bear, has been allowed to drift along somewhat as the iron and brick trades were allowed to drift along for years before the teachers of scientific management made definite rules to further efficiency.

It is true that progress has been made in the efficiency of maintenance of way work, but this progress is rather haphazard and spasmodic without definite rule or principle. While nothing definite has been done to standardize track work, yet the tendency is towards economy and improvement by means of greater efficiency.

This is necessary for two reasons: first, scarcity of efficient foremen; and second, inferiority of foreign labor compared with native labor of the early days of railroading. The first problem—that created by the scarcity of good foremen—should, I think, be met and solved by carrying in each gang a first man or assistant foreman who shall be educated and instructed to take the place of the foreman. The personality of the supervisor or roadmaster is a powerful agent for the successful accomplishment of this education. An efficient supervisor instructs his foremen along similar lines so that all under him think as one and act as one. I have seen miracles performed by a supervisor whose character is summed up in his utterance, "I don't want a foreman from some other division or some other road; I make my own after my own pattern." Under such a man the fundamental principles of scientific management is carried out, viz., the education of the laborer to do work economically. The solution of the second problem will follow when the first is accomplished. An efficient foreman always develops a powerful and efficient gang. Even the foreign laborer is quick to discover the strength or weakness of a foreman and his work is done well or poorly according to his opinion of "the boss."

To my mind the burden of economy in track work rests with the man in direct charge of the foreman, and such a man is successful in so far as he gets "on the ground" with the actual work and sees that it is done properly and cheaply. The roadmaster or supervisor who does his business from his desk or from the rear of a train is misdirecting his efforts.

An effective means towards increasing efficiency is the practice of holding staff meetings, in force on many roads. On the New York, Susquehanna & Western staff meetings are held, first, by the superintendent and his staff, monthly; second, by the division engineer, with his supervisors, master carpenter and signal supervisor, monthly; and third, by the engineer maintenance of way, superintendent, division engineer, supervisors and track foremen, twice a year. The superintendent's staff meeting tends to a better understanding of operating and maintenance of way problems and consequently a correct solution of same. It creates a unity of action of the several different and oftentimes warring departments of the division. At these meetings the maintenance of track receives its own proper discussion with beneficial results. The division engineer's meetings outline a uniform and standard practice in the season's work and the results are invaluable for improving unity of effort, organization and proper accomplishing of work speedily and cheaply.

The foremen's meetings at the end of the winter and summer seasons, respectively, bring the foremen together with two very beneficial and money saving purposes; first, the impression is conveyed forcibly to the foremen of the sympathy of the management towards them which is an encouragement and incentive to increased efficiency; second, by discussion and instruction. Standard practices in their work are explained in detail so that maximum units of cost of various classes of work are determined and the most economical methods decided upon to suit varying conditions. Along this line of endeavor a printed book stating the standard practice on various classes of work is given each foreman for his guidance. This is a step towards the standardization of track work, and is a gain in efficiency and a beginning of scientific management in maintenance of way work.

While these staff meetings are beneficial the real education of the foremen rests with the supervisor and the real "missionary" work must be accomplished by him. The lessons taught in the staff meetings must be demonstrated and explained to the foremen on the ground.

Wonderful results have been attained over old conditions by improved tools, power ditchers and hoists, motor cars and speeders. The simple example of increased efficiency by the use of a spot board over the old system is but a step towards better results. It is sometimes hard to convert one of the old school to modern ideas, but here it is that the supervisor, if he is a true educator, accomplishes what staff meetings cannot perform. The use of speeders for lampmen, resulting in reducing the number of lampmen by six men with an annual saving of over $2,000 per year on one sub-division alone is another example of what modern appliances are accomplishing towards the economy of labor and material. Many other examples could be given.

I believe that, eventually, scientific management of maintenance of way labor will accomplish startling and undreamed of saving in money, by the application of piece work or contracting of various work. On the Erie the contracting of painting and minor carpenter repairs has been put into effect with decidedly favorable results. Under the old system, if repairs to a station or other building were required it was necessary to send a carpenter to that point by train, consuming sometimes practically a whole day in minor repairs that could be performed in less than an hour of actual work. Under the contract system a local contractor makes the repairs, after his bid for same has been approved by the division engineer, and he is paid at once by the agent from his station funds. This is applied to work not amounting to more than $25. This same principle is to be applied to the renewal of ties this season, thereby securing a uniform rate per tie as against a varying and uncertain unit as heretofore, and eventually, no doubt, the rules of scientific management will cover all points in maintenance of way expenses, when the natural tendency of the laborer to do things the wrong, the longest and the most exhausting way will be overcome and when the laborer will be educated in the everyday details of his work.

SECOND PRIZE.—HOW THE ROADMASTER CAN PROMOTE EFFICIENCY.

BY R. H. ORWIG,
Supervisor, Cumberland Valley, Chambersburg, Pa.

This is certainly a subject that cannot be treated in few words, but assuming first that you have an efficient roadmaster, the following few remarks cannot go amiss.

A roadmaster should treat his position as if he owned the railway; as if all the money spent came out of his pocket. If this were really the case, the first thing he would do would be to get rid of the drones and try to get men that would give 100 per cent. service. The roadmaster should get rid of all men out of whom he is not getting what he considers the greatest amount of good work. It is certainly not economy for a railway company to have a certain percentage of men on the section who are too old for real work just because "they were good men when they were young." Places as crossing watchmen or other easy positions should be found for them, or they should be relieved and pensioned and their places filled with younger men. The roadmaster certainly cannot get 100 per cent. service out of 60 per cent. material. This may seem to some a harsh way to start, but it is the only way if he expects to get results.

A roadmaster's duty is to get a certain amount of work done in the best way in the shortest time and at the least expense to the company. He could not do this if he had poor tools—if he had six good tamping picks and four worn out picks being handled by ten good men, he could not be expected to get as much work done as if he had ten good picks handled by ten good men. Then why should he have six good men with six good picks and four poor men with four good picks? If he tries to keep the tools 100 per cent., why not the men? I simply mention this to show that efficiency is simply a man proposition; they should be the best you can get for the wages you pay.

After the roadmaster has gotten rid of his drones and poor men, among them several foremen, there is then considerable work in bringing his men to his way of working and thinking. When he gives a foreman a piece of work to do, he should tell him how to do it and give him the reason for doing it that way. The foreman may have had a method of his own, which he studied out himself, or which he saw someone else use, and yet not have any particular reason for using it. The next time the roadmaster orders the foreman to do the same kind of work, it will not be necessary to give the reason, as the foreman has already learned this. This method will gradually lessen the roadmaster's work and establish uniformity, which is bound to bring results. He should teach the foremen to ask questions as to why certain work is done in a certain way. By knowing the reason for doing the work that way the foreman can work intelligently. The roadmaster should study the foreman and in turn have him study the men.

The trackwalker should not only be a very observing man, but one on whom the foreman can rely, as he is a man that can save the company each day many times the amount of his wages. He should be a picked man, in line for promotion as foreman, and receive a higher wage than the other men in the gang. There is no truer adage when applied to maintenance work than "a stitch in time saves nine." In other words, the trackwalker can frequently tamp up a place in the track just beginning to shown signs of being low, spike in a rail that is just beginning to spread, and do much other work, which, if it were neglected, would require the entire gang later to put into proper shape. It's economy to have good trackwalkers.

The foremen should not be given more men than they can work to advantage; some foremen are lost with a large gang and can accomplish more with six men than with ten. This is important and should be watched closely. Because a foreman can put in 30 ties a day with five men, it does not follow that he can put in 60 ties with ten men. If he can, it saves the pay of one foreman; if he cannot, it loses money.

Foremen should arrange their work so that their men may start actual work in the morning when they arrive where the work is to be done. Too frequently after a gang of men arrives at work in the morning the men stand idly about while the foreman goes over the track and points out the places he intends to surface or marks the ties he wishes to replace. A foreman, by arranging his work properly, can do this the previous evening before the men quit work, which will allow them to start in as soon as they arrive in the morning.

Newly made foremen always have a fear of the material and other reports that they must send to headquarters; the time books and distribution of time are a nightmare to many new foremen. The constant worry about the "office work" often keeps good men from doing their best work on track. This can easily be overcome by requiring the men, while they are assistant foremen, to make out the different reports, first with the foreman, and afterwards by themselves, every alternate month. In this way they become familiar with the forms and start on this work as foremen without the above mentioned fear. The roadmaster must teach system and call attention to small things; when the foreman takes care of the small things, the question of looking after the larger matters follows easily.

The foreman should be made to feel his responsibility. He has a big job, but does not always appreciate it. By making him feel his responsibility, his pride in his work and his desire to do things well are increased, from which nothing can result but benefit to the railway.

Healthy criticism of work is always welcome and should always be made when the roadmaster is alone with the foreman. He should not be "called down" in the presence of the men, and not at all if it can possibly be helped. Of course, should a foreman show a careless trait and continually make the same mistakes, the only course left is to discharge him.

When the foreman does any work well or shows original ideas, the roadmaster should tell him about it, in the presence of his men, so that they too may share in the pleasure that they are bound to feel.

As a parting remark. the roadmaster should never "nag." Nagging is chronic with some men and brings us back to the first suggestion as to how to secure efficiency in the foremen—first have an efficient roadmaster.

THE ROADMASTER'S RELATIONS WITH HIS FOREMEN.

BY J. F. M'NALLY,
Asst. Supt., A. T. & S. F., Chanute, Kan.

It is not my intention to describe a specified course of instruction for roadmasters and foremen to follow, but to deal with the subject in a general way and make some suggestions that I have absorbed in dealing with men during my 33 years' experience as a track man.

Instruction to section foremen must, to a large extent, be individual; therefore, in making an analysis of the essentials of such instructions, I find that in order to secure the best possible results the roadmaster must, first, know the foreman; second, gain his confidence; third, have a mutual understanding with him along all lines of his work.

The first requirement for successful instruction is a knowledge of the foremen, and, in order to gain this knowledge, the roadmaster must be a good judge of human nature. He should be able to size up his man at a glance or in casual conversation with him. A roadmaster should never antagonize his foremen. He should meet them as often as possible and go over the section with them; talk about the work that is needing attention; pick out the weak places and ask their opinion as to the best method of putting these places into good condition. He should let the foremen understand that he knows that they have opinions on these subjects, and then if their opinions agree

with his, tell them so; if not, advise them how it should be done. There is no question that roadmasters can save considerable money for their company and also much time of the foremen by handling matters in this way.

Section foremen worry whenever there is a change of roadmasters. It does not make any difference how long they have worked for the company; they dread a change, providing of course, they worked in harmony with the former roadmaster.

The first thing a new roadmaster should do is to go over his division on a motor car instead of on trains. This gives him an opportunity to get acquainted with the foremen and talk with them in regard to the different kinds of work to be done, and if he thinks that it is necessary to make any changes, he can explain them to the foreman so he may understand more readily just what is wanted. He should also give the foreman to understand that he has no followers and, as long as they do their work satisfactorily, their positions are secure.

A short time ago, a general superintendent was going over the division on which a new roadmaster had been appointed. He met one of the old foremen, shook hands, and passed a few pleasant words with him, and said on leaving, "How long have you had charge of this section?" Mike spoke up very promptly, pointing to the new roadmaster, "If he will let me stay until next month, I will have had charge of this section 32 years and have never had a wheel off." It is needless to say that Mike is still on the job. It can readily be seen how some foremen feel about a change of roadmasters. This foreman, after working 32 years, and always giving good service, was wondering what the new roadmaster was going to do with him. It simply confirms the former statement that roadmasters must gain the confidence of their men. It is not always an easy matter to do, but it can be done by talking to them.

It is surprising how some of the foremen become interested in the suggestions offered by the roadmaster, and it is not long before a confidential relationship is established between the two. It simply remains for the roadmaster to give a square deal, in every case, that is, to be square with the men and with the company that they are all serving. He should show the men that he is their friend at all times and should encourage their confidence at every opportunity, giving them the best advice at his command, even if it is necessary to go out of his way to do so. I will even go farther and say that it is the duty of the roadmaster to know, to a great extent, how his men spend their idle time around town, and if it is found that they are not spending it to good advantage, he should talk to them in a pleasant way, explaining that it is because it is to their mutual benefit that he is taking the liberty of advising them.

In many of our smaller towns, the station agent and the section foreman are the only local representatives the railway company has, and for this reason, the roadmaster should be very careful in chosing his foremen. He should make an effort to select a man of good moral character and one who is a respected citizen in that community. No business can succeed without the confidence and respect of the patrons, and as the section foreman is the company's representative, he should be a man of good judgment and one who will make friends in the community in which he lives. He should try and cultivate the friendship of the farmers on his section and by so doing he can save money for the company each year. For instance, he can more readily secure permission from the farmers to make fire guards, and assistance from then in running these fire guards through their farms. He should encourage the farmers to give permission to make substantial fire guards, as by so doing he will not only protect the property of the farmer, but also of the railway.

A good section foreman is one of the most valuable assets of the railway, as he can save more money each year than almost any other employee. The roadmaster should pick out young men of good character and educate them as to the best methods of performing the duties of a section foreman and should teach them to economize in their work. He should, as far as possible, pick out men that are not afraid of work, and who, in his opinion, will assist the men in performing their duties. A man of this kind will accomplish more work each day than a section foreman who stands around with his hands in his pockets and has a continual grouch.

A roadmaster should be kind to his men and should never pass his foreman without speaking a word of encouragement to him. At times, a foreman will get discouraged and a kind word will make him feel that his work is appreciated. I would suggest that roadmasters treat their foremen in the way they would like their superiors to treat them.

It is not always possible to get good foremen, and when they are secured, it is to the advantage of the company to keep them. The section foreman should always be glad to see the roadmaster come over his section, as he can ask questions about the different kinds of work and the manner in which the work should be done. The roadmaster can then explain the duties better than by staying in his office and writing long letters.

A roadmaster should spend but little of his time in the office. He should be out on his division every day, and if he has any important or special work to do, he should personally see that the foreman understands how the work should be done to the best advantage and the least expense to the company.

If a roadmaster should have a foreman in his employ who is not doing a sufficient amount of work with the number of men he has employed, he should talk to him, and in a great many cases he can make suggestions which will enable the foreman to increase the amount of work.

It is not advisable to be making changes in foremen, as when a foreman gets acquainted with the bad places on his section, he can do more than a new man.

This supervision and close attention to duty will enable a roadmaster to maintain good track at a low cost.

WEEKLY PROGRESS REPORT FOR SECTION FOREMEN AS A MEANS OF INCREASING EFFICIENCY.

BY W. G. DUNGAN,

Roadmaster, C. B. & Q., Orleans, Neb.

During the present season the writer has been furnishing the section foremen a weekly progress report, showing each foreman what he did and what every other foreman did the previous week, and the unit costs of each kind of work. This report acts as an incentive to each man to keep his unit costs down, and also serves to impress upon him the importance of the cost item. It tends to keep the men at one kind of work more steadily, and to avoid the waste of time changing from one kind of work to another and affords a basis for comparing the work of the different gangs. Such a report gives the roadmaster valuable cost data for the different kinds of track work, something about which most of us have rather vague ideas when it comes to unit costs. The plan has not, as some might think, caused the foremen to slight their work for the purpose of making a good showing on paper. They have taken kindly to the scheme and are always anxious to get the report Monday morning to see how they line up with the "other fellow." If a man's unit costs run higher than the average, he is usually anxious to make an explanation without being asked. The unit cost of renewing ties has been materially reduced from the figures of the first few weeks. The cost of getting out these reports is a very small item. One man (in this case, the writer) will figure the unit costs and make 27 copies in about three hours. The foremen make a telegraphic report Saturday night showing hours worked and ties renewed during the week.

Instructions are issued insuring uniformity of work. For tie renewals, ties are to be full spiked, roadbed dressed to standard section and old ties piled. These items are included in the unit cost of tie renewals. The distribution of ties is figured

as a separate item. The section foreman's surfacing shows the hours worked, the number of ties tamped, and the distance covered during the week. The distance covered indicates the lineal feet of track surfaced, lined, and dressed to standard section. The unit cost is figured on the basis of the number of ties tamped. As will be seen from the attached sample report, the cost of tamping a tie is somewhere near a uniform quantity, regardless of the distance covered.

When the ditches are cleaned, the road's standard dump box is taken as a unit of measurement. The section foreman's report shows the number of hours worked, the number of boxes of dirt moved and the distance covered. The distance covered means lineal feet of track ditched on both sides. It would be desirable to include the length of haul, but it was thought best not to tax the foremen with keeping track of this item. Of course, there will be a variation in the way the boxes are filled, and the information will not be exact from an engineering standpoint. However, it affords some basis of comparison and the writer believes a comparison, even based on approximate quantities, is better than no comparison.

The full benefit of these reports will not be realized until the second year, when we will have the previous year's figures as a guide. The reports have an immediate effect, because they are furnished while the work is in progress, and not, like most railway statistics, several months after the work is finished and forgotten.

Surfacing report for week ending May 26:

Sec.	Ties Tamped.	Hours.	Cost per Tie.	Distance.
T 1	130	40	.0500	140 feet
T 2	434	130	.0484	720 "
T 3	556	136	.0392	930 "
T 4	317	80	.0410	1020 "
T 6	239	80	.0544	600 "
U 1	531	140	.0423	1290 "
U 2	575	225	.0640	2400 "
U 3	596	240	.0654	1620 "
U 4	531	190	.0593	2190 "
U 5	702	180	.0441	1320 "
U 6	369	180	.0851	1800 "
U 7	613	210	.0554	1740 "
U 8	615	235	.0622	1540 "
U 9	217	180	.1382	2160 "
U10	537	180	.0558	1440 "
U11	710	225	.0517	1950 "
U12	567	200	0573	1620 "
U13	500	220	.0720	.... "
U15	586	240	.0665	1050 "
U16	580	215	.0608	1380 "
U17	726	287	.0634	3160 "
Average			.0608	

HOW THE ROADMASTER CAN PROMOTE EFFICIENCY.

BY B. A. WEST,

Roadmaster, Atchison, Topeka & Santa Fe, Pueblo, Colo.

The following plan has been in practice for the last three years on the Colorado division of the Santa Fe, and is considered by the local officers as one of the best ever tried:

All the foremen are brought together twice a year, once during the summer and once during the winter. They spend the day discussing important subjects pertaining to their work, such as making temporary repairs to switches, frogs. track and telegraph lines, repairing washouts, handling wrecks, surfacing and lining track, inserting ties, handling of foreign laborers, manner of keeping reports and time, and any special work with which they may have difficulty. The roadmaster tells them the turn conditions have taken in the financial affairs of the railway company and explains, for instance, why reductions of forces are necessary at times even when the road may be doing a good business.

These meetings not only freshen up the foreman, but give him an opportunity to get a day off once in a while and see how his neighbor is conducting his work. In this way he gets pointers he would never have secured had he remained at home.

Some railways have established apprentice schools for their shop and mechanical men. Why not organize similar classes for the maintenance of way department? This should be one of the best and most economical methods of promoting efficiency in the maintenance of way department.

HOW THE ROADMASTER CAN PROMOTE EFFICIENCY.

BY J. J. BURNS,

Roadmaster, Michigan Central, Bay City, Mich.

The efficient management of American railways demands the best efforts of men scientifically educated in the several specialties. Each succeeding year marks some advance along these lines. The reign of the rule-of-thumb railway officer will soon be ancient history. Railway maintenance is an exact science, and only scientific management can survive the severe tests of increasing competition in this era of high priced materials and low priced transportation.

The roadmaster must meet his share of this ever increasing demand for ability. He must be a constant student, as he is a constant teacher. He not only can, but must, promote efficiency by the constant exercise of a diplomacy rare among men outside of professional diplomatic service.

The roadmaster must be a just judge. He must be an observant student of human nature. He must so handle his section foremen as to keep their many responsibilities constantly before them. He should avoid issuing arbitrary orders. The art of arguing a foreman into admitting that he can spare a dozen rails or a half hundred ties off his yearly estimate is far in advance of an arbitrary order to "cut it out." This reasoning places the foreman in a responsible position; it appeals to his judgment; it increases his worth as an employee responsible for the road's safety.

Comparative cost data are most important in handling section forces. Given the detailed cost per mile of track covering each section separately for the preceding month, a roadmaster can do more good by talking comparative costs with his foremen than by all the general economy schemes combined.

Comparative detailed cost data shows at once which foreman is economical, and which one is extravagant, and in what particulars. A rivalry in true economy is instantly created among the foremen. Thus the spirit of economy and resulting efficiency is instilled into the users of material, tools and labor.

MAINTAINING THE FLOOR OF A LONG STEEL VIADUCT.

BY A. W. CARPENTER,

Engineer of Structures, New York Central & Hudson River.

A viaduct on the New York Central & Hudson River, about one and one-quarter miles long carrying four tracks, has a ballasted steel trough floor with three lines of supporting girders, one line of girders being located between the inside tracks and one line outside of each outside track. The troughs, which are of rectangular section and about 15 in. wide and 16 in. deep, were originally provided with protection from corrosion by painting and by filling the bottoms with a "binder" consisting of a mixture of hot coal tar pitch and asphalt with sand and gravel. This binder was made about two inches thick at the centers of troughs (center line between outside pairs of track) and sloped to the ends of the troughs where openings were provided for drainage. The binder was also sloped up the sides and ends of troughs a few inches. The binder was applied on the shop coat of paint and field coats of paint were applied on the surfaces of troughs not covered by the binder. These included the upper 12 in. or more of the inside vertical surfaces of the troughs. The troughs were filled with ballast to the tops except the spaces occupied by the ties under the rails, the bottoms of which are placed somewhat below the tops of the troughs. The side and bottom surfaces of the troughs, are inaccessible except when the ties and ballast are removed.

Some six years ago the paint protection of the steel surfaces of the viaduct, especially of the floor troughs, had given out and it was decided to put on a special painting force to repaint the entire viaduct, including the interior surfaces of the troughs. The latter required the removal of the ties (temporarily supporting the rails on tops of troughs), the removal of the bal-

last, the scraping, cleaning and coating of the metal and the replacing of ballast and ties. The work was done under an exceedingly heavy traffic and every tie on the structure (about 10,000) was removed and replaced, together with the ballast under it, and the surfaces cleaned and given two coats of paint except where protected by the binder. The binder in the troughs was in good condition and protecting well the steel which it covered.

For certain reasons these new coatings, on the tops of troughs, especially, were soon damaged or became ineffective and about three years later it was necessary to again take steps to preserve the metal from corrosion. The paint coating of the insides of the troughs was also found to be failing again. To go all over the work of three years before, removing and replacing all the ties, was very serious, especially as meanwhile the tracks had been electrified and electric third rails added.

About this time it became necessary to begin the renewal of ties on a large scale and a plan was devised of handling the preservation work in combination with the tie renewals. When each tie was renewed, the track men removed and cleaned the ballast in its trough. The cleaning of the ballast is essentially necessary on this type of viaduct in order to promote drainage. While the troughs was open and the trackmen working on the next tie and troughs, the bridge men could come in, clean the surfaces and coat them with one coat of a heavy, quick-hardening coating, which is expected to preserve the metal until the tie is again renewed. The ties last four or five years on this viaduct.

In addition to the advantages mentioned above, it has been found that on account of the ties not being removed consecutively, the extensive bracing of the tracks previously required when the ties were removed and the troughs coated consecutively, is no longer required. This plan also gives more room for storing and cleaning the removed ballast so that, whereas formerly it was necessary to run out a work train every night to remove the rejected portion. Now it is only necessary to use the work train on an average of once a week.

The saving in combining the work of removing the ties and ballast is estimated at approximately $10,000 for one complete tie renewal over the viaduct, or a reduction of two-thirds of the cost of independent work in going over the viaduct in one operation to coat the troughs for preservation. Besides there is a saving in delays to train movement and a reduction in the chances for accidents.

SECOND TRACK CONSTRUCTION ON THE PENNSYLVANIA BETWEEN INDIANAPOLIS AND RICHMOND.

The Pennsylvania Lines, Southwest System, are now completing 25.9 miles of very heavy second track work on the Indianapolis division, between Richmond, Ind., and Indianapolis. East of Richmond the traffic between Pittsburgh and St. Louis is divided between two lines, while all this traffic passes over the one line west of Richmond. As a result the density of traffic west of this point is much greater than east of it. With the present business the train movements between Richmond and Indianapolis average about 50 trains daily, 20 being scheduled passenger trains, of which some often run in more than one section. In addition to this dense traffic, the grades are heavy, and in one or two places there is sharp curvature. Previous to the beginning of this work there was but 6½ miles of second track between Richmond and Indianapolis, a distance of 68 miles, and this was through the terminals.

In determining on the present improvements, the desire was to relieve the worst places first, and with this in view, reconstruction and second track work was authorized between Richmond and Dublin, 17.6 miles, and from Dunreith to Knightstown, 8.3 miles, in June, 1909, work being begun the following month. The heaviest construction work in these two sections is caused by the reduction in the ruling grade and the elimination of grade crossings wherever possible. This ruling grade was formerly 1.1 per cent., and is now being lowered to 7 per cent. compensated. With the completion of the work now under way, the maximum between Richmond and Indianapolis will be reduced to .9 per cent momentum, this maximum existing on stretches not yet rebuilt, and the present tonnage rating of 1,350 tons will be materially increased. In many localities a .7 per cent. grade might not be considered low, but in view of the fact that this line crosses the Ohio river drainage low down and at right angles, and that the securing of this .7 per cent. grade required the moving of earthwork averaging over 71,000 yards per mile, it was not considered an economy to lower the grade further. Out of the total of 25.9 miles of work undertaken, the grade line was changed on 21.3 miles; in many places very radically. The longest single change of grade was made at Knightstown, where the grade of the old line was revised for over 6 miles. The maximum raise in grade was made through Cambridge City, where the new track is 26 ft. above the old one; while the greatest depres-

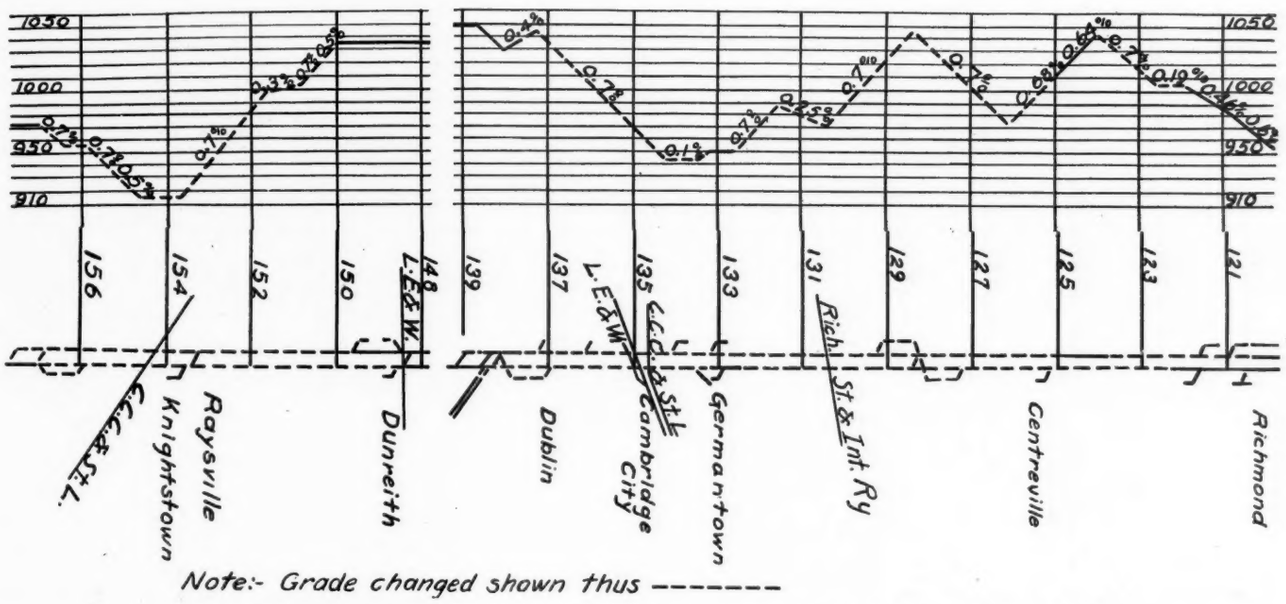


Fig. 1—Condensed Track Layout and Profile of Second Track and Grade Reduction Work.

sion was at Jackson's Hill, about 8 miles west of Richmond, where the track was lowered 22 ft., and 600,000 yds. of earth were removed from one cut.

The longest ruling grade established is 2.56 miles in length, at Cambridge City, while there are 13.52 miles of 7 per cent. grade out of the total of 25.9 miles. Wherever the grade was changed to any extent the new line was built for double track on an offset far enough removed from the old line to enable the new work to be completed without any interference with traffic, the old line being abandoned when the new line was put into service. With the exception of this offset location, but little change was made in the alinement, except at one point east of Knightstown, where a 3 deg. 50 min. reverse curve and a 1 deg. 52 min. curve swinging around a hill are replaced by a 1 deg. curve on a cut over one mile long, going through the hill and saving 120 deg. of curvature and 880 ft. in distance.

The total estimated amount of earth work is 1,850,000 yds., and is all being moved by contract, the contractors using steam shovels with small cars and donkey engines. The grading is now practically all completed and will be entirely done within a few weeks. All embankments are built with a 36 ft. crown and a base of 48 ft. is provided in all large cuts, allowing for a 6 ft. ditch on each side. Vitrified sewer pipe varying in size from 6 in. to 18 in. is laid below the cut ditches and back filled with engine cinders to provide for the sub-drainage. In but one case the contractor hauls material across the main line at grade, this being about one mile west of Knightstown, where the material from the cut west of town was needed for the high embankment extending through the village, and in which cut standard gage grading equipment was used. Because of the frequent and high speed passenger trains, it was necessary to fully protect this crossing, which is formed by two turnouts from the main line. Derails connected by pipe lines with the switches were installed at the clearance points on the construction tracks, while block signals bolt locked with the switches were erected for main line trains. A main line conductor is in charge of the crossing during the working hours. All main line trains are required to approach the crossing under control and to secure in addition to the block indication a hand signal from this conductor before proceeding.

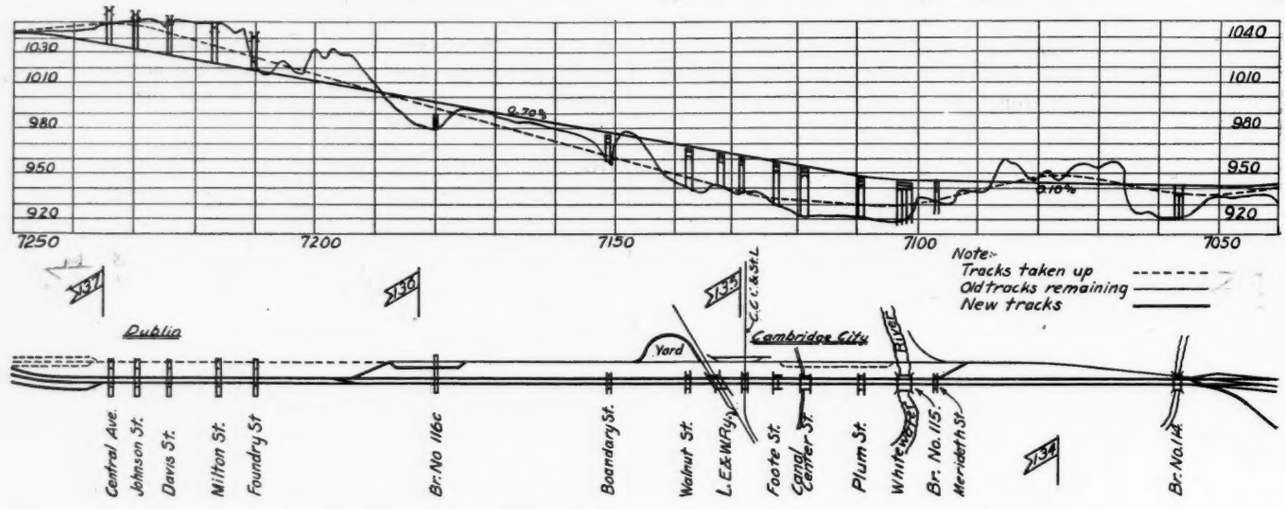


Fig. 2—Track Layout and Profile from Dublin Through Cambridge City.

Fig. 3—Sodding Cut East of Cambridge City.

The contractors are required to excavate to the required cross section and to trim the cuts up neatly, no back filling on the slopes being allowed. Following the excavation all slopes in cuts are sodded in accordance with the Pennsylvania System standard practice. This sod is bought by contract, delivered in strips 6 ft. long and 1½ ft. wide, and is placed by company forces. Boards held in place by pegs are placed on the slope longitudinally with the cut, at intervals of about 6 ft., to hold the sod in place until it gains a hold on the bank, as shown in one of the figures. With the exception of a few places where the sod was placed too late to secure a footing before frost, all that placed last season passed through the winter in good condition and has protected the bank from erosion. The ditches in these cuts are open and in good condition, and required no cleaning out this spring, in strong contrast with cut ditches ordinarily found on new work, which require frequent cleaning for two or three years. This sod costs from 5 to 6 cents per square yard delivered, and the labor of handling and placing it amounts to about 7 cents, making a total cost for the sod in place about 13 cents per square yard. In several of the cuts wet spots or springs appeared on the sides following the excavation. At these points before the sod was placed a 3-in. tile drain was laid a few inches below the surface, tapping the spring and extending to the cut ditch. Following this, the sod was placed as described.

In connection with this reconstruction work, grade crossings have been eliminated wherever possible, in accordance with the general policy of the road to do away with all grade crossings on new work where feasible, even if there exists a possibility that at a later date the expense of such work would be divided with the county or village. A considerable part of the change in grade was made to accomplish this object. The new line is elevated above the streets through Knightstown and Cambridge City, and depressed through Dublin, 17 crossings being eliminated at these points alone. In all, 25 street and highway and two railway crossings are done away with by the construction of four overhead and 16 under-grade crossings and the vacation of five highways previously crossing at grade. In addition, old wooden structures at 4 overhead and 2 under-grade street and highway crossings are replaced by permanent structures.

Next to the heaviness of the work considered as a whole, the thing which strikes one's attention is the number of openings provided for streams and highways and the high-class of structures erected. Concrete is used throughout without reinforcement of any kind, except that in certain foundations some old rails were inserted. Where possible arches have been built, but where the head room is limited, concrete abutments with steel trough floors are substituted. At Dublin, where the streets are carried overhead, the bridges are of the reinforced concrete girder type shown in Fig. 4. Nineteen arches in all have been built, with spans ranging from 10 ft. to 66 ft., while 13 bridges of the steel trough floor type were built of spans ranging from 30 ft. to 70 ft. Three plate girder bridges were also built, with spans ranging from 40 ft. to 70 ft. The largest structures are three triple 60 ft. arches over streams at Centerville, Cambridge City and Knightstown, each of which contains over 5,000 yds. of concrete. Over 71,000 yds. of concrete in all were required, this work being contracted in connection with the grading.

Special structures were required at a number of places where

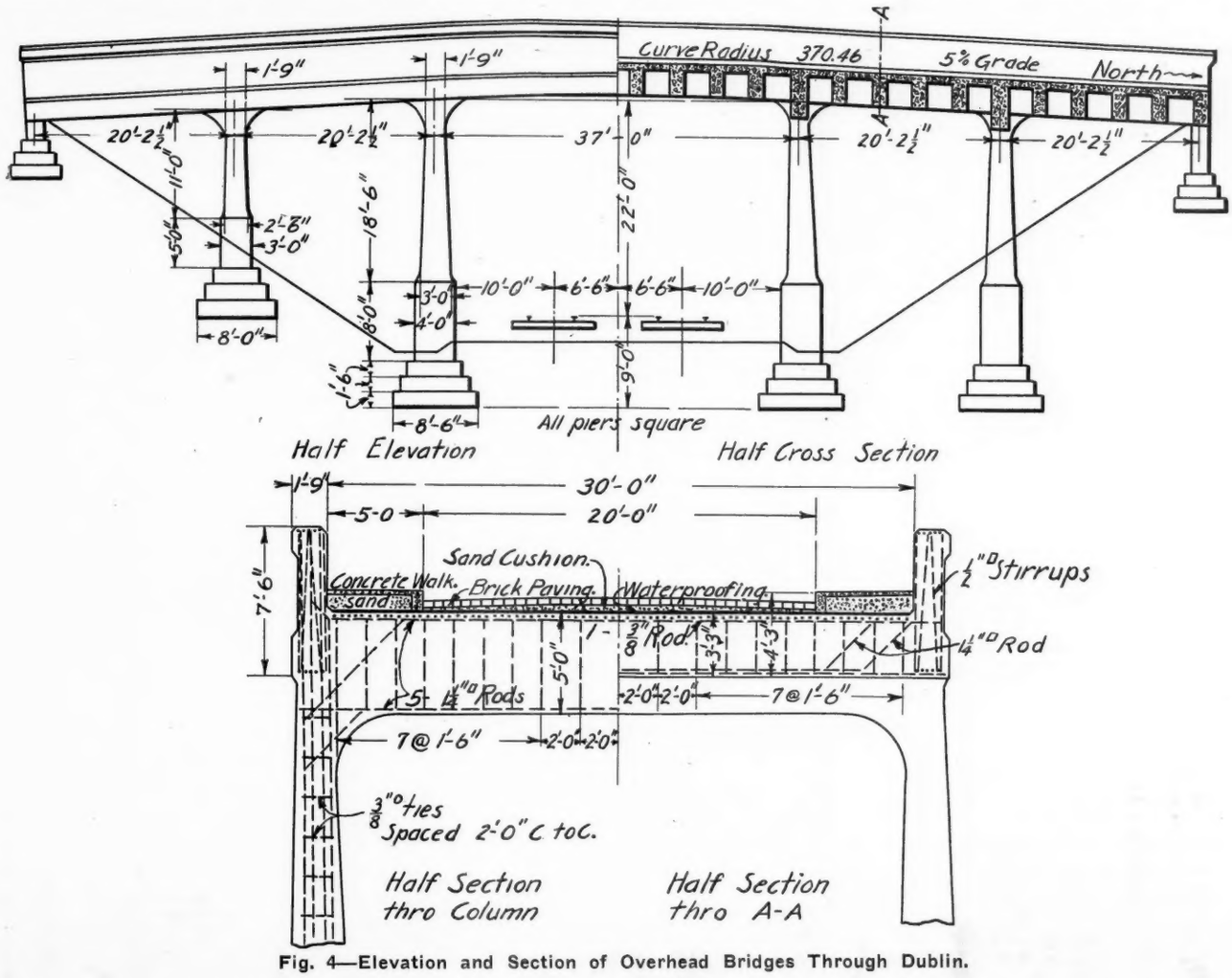


Fig. 4—Elevation and Section of Overhead Bridges Through Dublin.

Fig. 5—National Road Subway at Raysville, Ind.; Pennsylvania Railroad.

Fig. 6—60-Ft. Skew Arch and Centering Over Center St.; Cambridge City.

this line crosses the National road, an old turnpike constructed from Washington to St. Louis before the railways reached this part of the country. It is interesting to note that this road forms the main street through the cities of Wheeling, W. Va.; Springfield and Columbia, Ohio; and Richmond and Indianapolis, Ind., as well as of the many smaller villages through which the lines passes. Because of the importance of this road, county officials were very particular in making agreements with the railways for the new crossings, requiring large openings and but little change in grade. The opening shown in one of the illustrations is an example of several such structures built. At Dunreith the commissioners rejected a proposal of the railway company to lower this road 7 ft. and elevate the tracks the same amount to do away with the grade crossing.

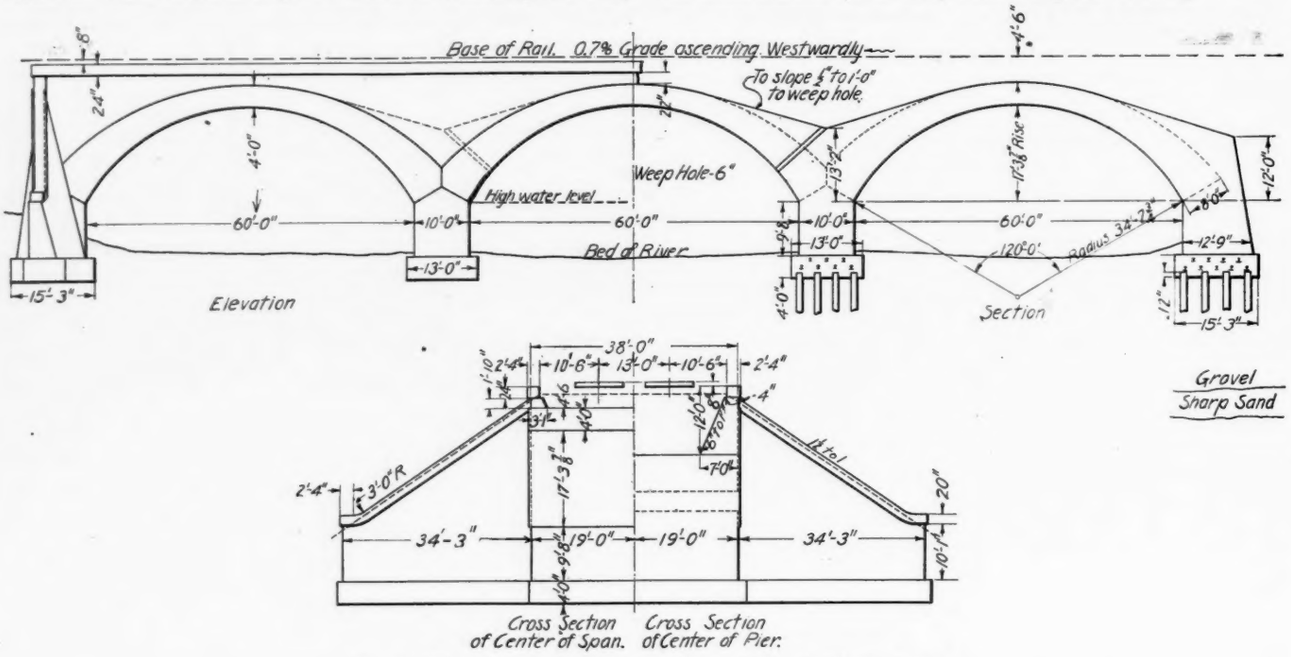


Fig. 7—Elevation and Cross Section of Triple 60-Ft. Arch.

The type of arches built is shown in four of the figures. In constructing arches of from 40 ft. to 70 ft. span, the arch ring was divided into seven voussoirs of equal length on the intrados with radial bearing planes; while for arches of less than 40 ft. span the ring was divided into but five voussoirs. Each voussoir was cast separately as a monolith without any

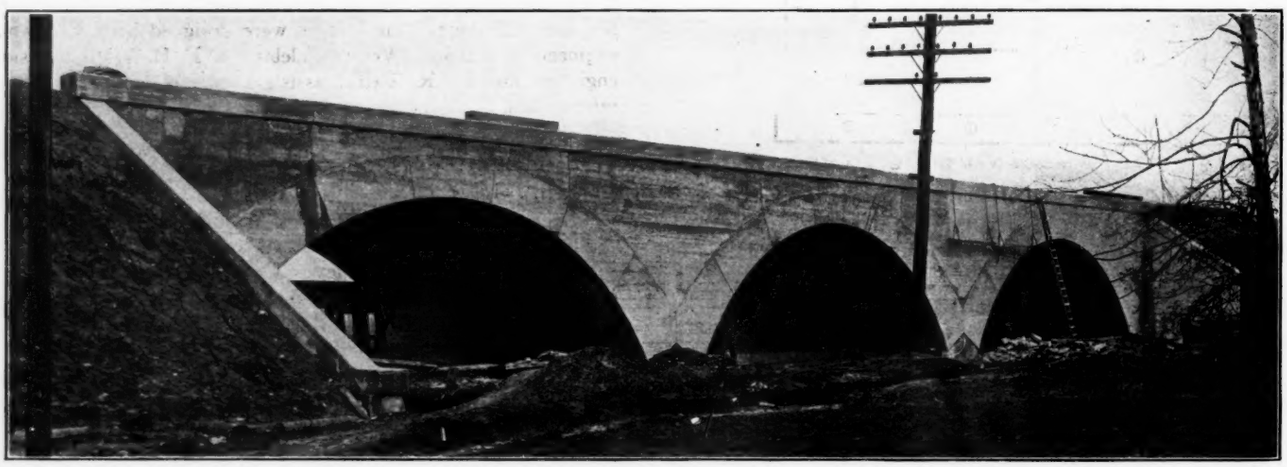


Fig. 8—Triple 60-Ft. Arch at Centerville, Ind.

attempt to bond it to the adjoining masonry. In placing the spandrel walls, wing walls and coping, the same practice was followed, the spandrel walls and coping being built in sections about 30 ft. in length to allow for temperature variations. The relative order of construction followed in the building of these arches is shown in one of the illustrations. In this connection it should be noted that the keystone voussoir was placed be-

Fig. 9—Arch at East Haven.

fore those on either side. No attempt has been made to maintain open joints between the various sections by the use of paper or wood filler. The provisions made for expansion have resulted satisfactorily thus far, and no cracks have opened except at the joints. Wherever possible the wing walls have been built at right angles to the tracks, so that they can be utilized at any future time that additional tracks are necessary. On all overhead bridges the standard clearance of 21 ft. above the top of rail has been maintained.

Special attention has been given to the waterproofing of the bridge structures. A covering of 3-ply Barrett specification felt and tar is placed over the barrels of the arches and dapped up 1 ft. on the spandrel wells, which are then coated with pitch

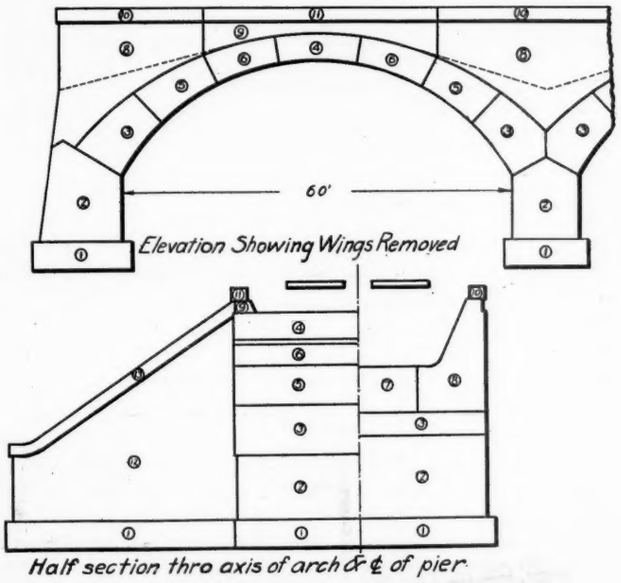


Fig. 10—Order of Construction of Arches.

to the top of the embankment. On the steel trough floors four thicknesses of Barrett specification felt are laid with one layer of Tartex placed in the middle. All layers are cemented together with pitch, while the bottom thickness of felt is placed on the concrete dry to avoid cracking with any movement of the concrete. A cushion of fine sand is then laid above the waterproofing and on top of this a protecting layer of common brick. Wherever the grade exceeds .5 per cent. new crown is provided at the middle of the span and the waterproofing is laid parallel with the grade.

A highly finished surface on the concrete is secured by rubbing the exterior with a concrete brick and water as soon as the forms are removed. A structure with this work partially done is shown in Fig. 8. The concrete used in the arch rings is a 1:2:4 mixture and all other concrete is 1:3:6. Crushed limestone is used in all cases.

Because of the elevation of the line through Cambridge City it was necessary to move the junction of the branch leading southwest toward Louisville to a point 3 miles west of Cambridge City, requiring the construction of five miles of single track branch line between Bentonville and the new junction and the abandonment of the old line between Bentonville and Cambridge City.

Pennsylvania standard 85-lb. rail is being laid on oak ties with 18 in. of gravel ballast under the ties, the ballast being secured from a pit at Germantown. All track work is done by company forces. The main lines are built 13 ft. centers, while passing tracks are 17 ft. from the main line. Both eastbound and westbound advance passing tracks are provided at intervals of about five miles of a length sufficient to hold 120 cars, or two maximum trains each, and with a trailing crossover between

Fig. 11—Walnut St. Subway; Cambridge City.

them at stations. All main line crossovers and switches entering passing sidings will be handled from interlocking plants, while the outgoing switches of passing sidings will be controlled from the interlocking plants by electric locking. Telephones will also be installed at these outlying switches for purposes of quick communication.

The cost of this work is estimated at $2,750,000, or a little more than $106,000 per mile. The contractors on the grading and masonry work are the Drake & Stratton Co., of Philadelphia, Pa., P. F. Brendlinger, also of Philadelphia, and Lorimer & Galligher, of Chicago, while A. J. Yawger & Company, of Indianapolis, Ind., are building the overhead bridges at Dublin.

This work is being done under the direction of W. C. Cushing, chief engineer of maintenance of way, by the division forces. S. B. Robertson, superintendent of the Erie & Ashtabula division, formerly division engineer of the Indianapolis division, prepared the plans. The bridges were designed by J. C. Bland, engineer of bridges. We are indebted to F. H. Watts, division engineer, and G. R. Barry, assistant engineer, for the above information.

PROPORTIONS OF CONCRETE MATERIALS.

Engineers frequently have occasion, in ordering material for concrete, to estimate the quantities of various materials needed. The following table is sufficiently accurate for all ordinary purposes and gives the amount of the various materials needed per yard of concrete:

Mixture	Cement (Barrels)	Sand (Cu. Yds.)	Stone (Cu. Yds.)
1-2-3	1.83	0.51	0.77
1-2-4	1.57	0.44	0.88
1-2½-5	1.29	0.45	0.91
1-3-5	1.22	0.51	0.86
1-3-6	1.10	0.46	0.93

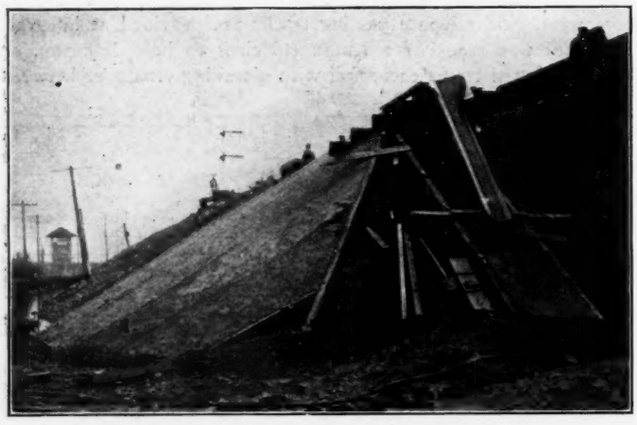
PROTECTION OF EMBANKMENTS FROM HIGH WATER.

BY C. F. GREEN.

Supervisor Bridges and Buildings, Southern Pacific, Sacramento, Cal.

For years past, in common with most roads, the Southern Pacific has used rock by the carload in times of high water, to protect embankments from washing. This method is unsatisfactory unless the rock is used in large quantities and is also slow and expensive. To overcome these objections other methods have been adopted for both temporary and permanent protection.

For temporary protection a brush mat is used which can be placed in a current swift enough to wash away rock weighing half a ton. In making this mat, if possible, the brush is cut as long as the slope or bank of the fill in question. It is made up into bundles by tying the brush together with baling wire or small rope at intervals of about 3 ft., the bundles being made of

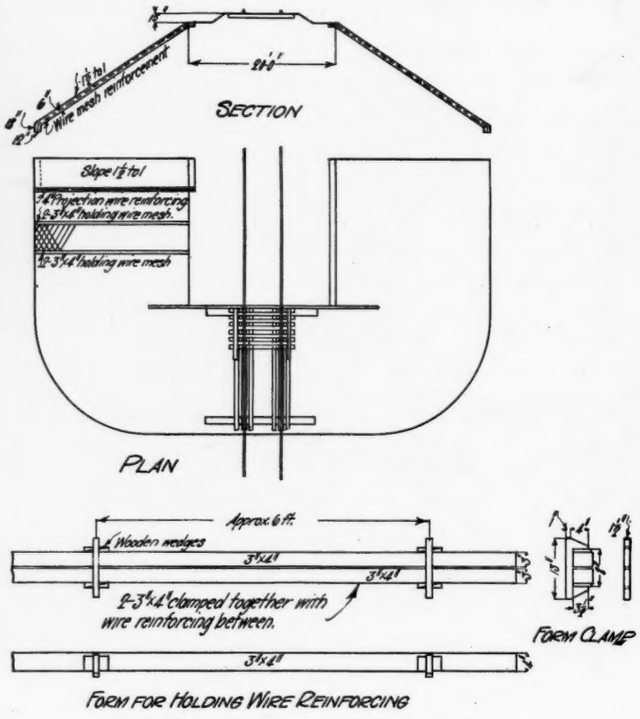


Constructing Concrete Revetment.

such size that they can be carried by three or four men. These bundles are placed close together along the track, the small ends projecting toward the water, and are fastened together with baling wire. When enough bundles have been laid out to protect the entire length of the wash, a heavy line, the weight depending on the swiftness of the current, is fastened around the middle of the down stream bundle, and then around all the other bundles until the last one up stream is reached. The end of this line is then tied to a tree or dead man up stream, where it will hold the mat against the washed bank when afloat. A number of small lines about the length of the bundles are fastened to the ends of the bundles next to the water at intervals of about 20 ft. Starting at the up stream end, the mat is then shoved over into the stream, while men hold on to the short line so that the mat will not swing away from the bank. About two or three feet of the mat is left on top of the bank after it is shoved into the water. Starting at the down stream end, scrap rail, long enough to reach from one short line to the next, is thrown out on to the mat as far as possible under these short lines for the full length of the mat to weight it down. If the rails are shoved out on the mat to where the small ropes are fastened to the bundles, the lower edge of the mat can be brought to the base of the wash by hauling in or letting out the lines, and the wash effectually stopped. Using a mat made in this way has been found to be the most feasible plan for emergencies and can be made in a very short time. When washouts occur frequently brush is stored in some convenient location for quick use. At one point washing was quickly stopped on the sides of an 18 to 20 ft. fill 200 ft. long, back of a U abutment, at an approach to a steel bridge by this method.

For the permanent protection of embankments riprap has been used on revetment work with little satisfaction unless placed in large quantities and laid to face, chinked and pointed up. The difficulty with this sort of protection is that when the fill gets wet and settles, the face of the rock is broken up and the water scours out back of it. For the past two years the Southern Pacific has been using a 6-in. concrete mat with wire netting in the center as reinforcement. This has been found very satisfactory and makes a cheap permanent revetment. When placed on fills which settle badly it does not pull apart and prevents the water from getting at the fill.

In constructing this reinforced concrete revetment, the bank is graded off to a standard 1½ to 1 slope, and a trench 12 in. x 18 in. is dug around the bottom of the slope. This trench is filled with concrete with the end of the wire placed in the center. A piece of 3 x 4 timber is then laid up the slope at each edge of the width of wire. Using suitable clamps and wedges, as shown in the drawing, these timbers can be kept the proper distance apart, so as to hold the wire tight, the wire being clamped to the timbers. Three inches of concrete is placed both above and below the wire. After the concrete has set sufficiently the timbers are removed. Alternate sections are built first, in order that the men may not have to walk on the new concrete. The four inches of wire projecting from each alternate



FORM FOR HOLDING WIRE REINFORCING

Method of Building Concrete Revetment.

section is fastened to the intermediate section by tying with small wire, after which these sections are built the same as the first.

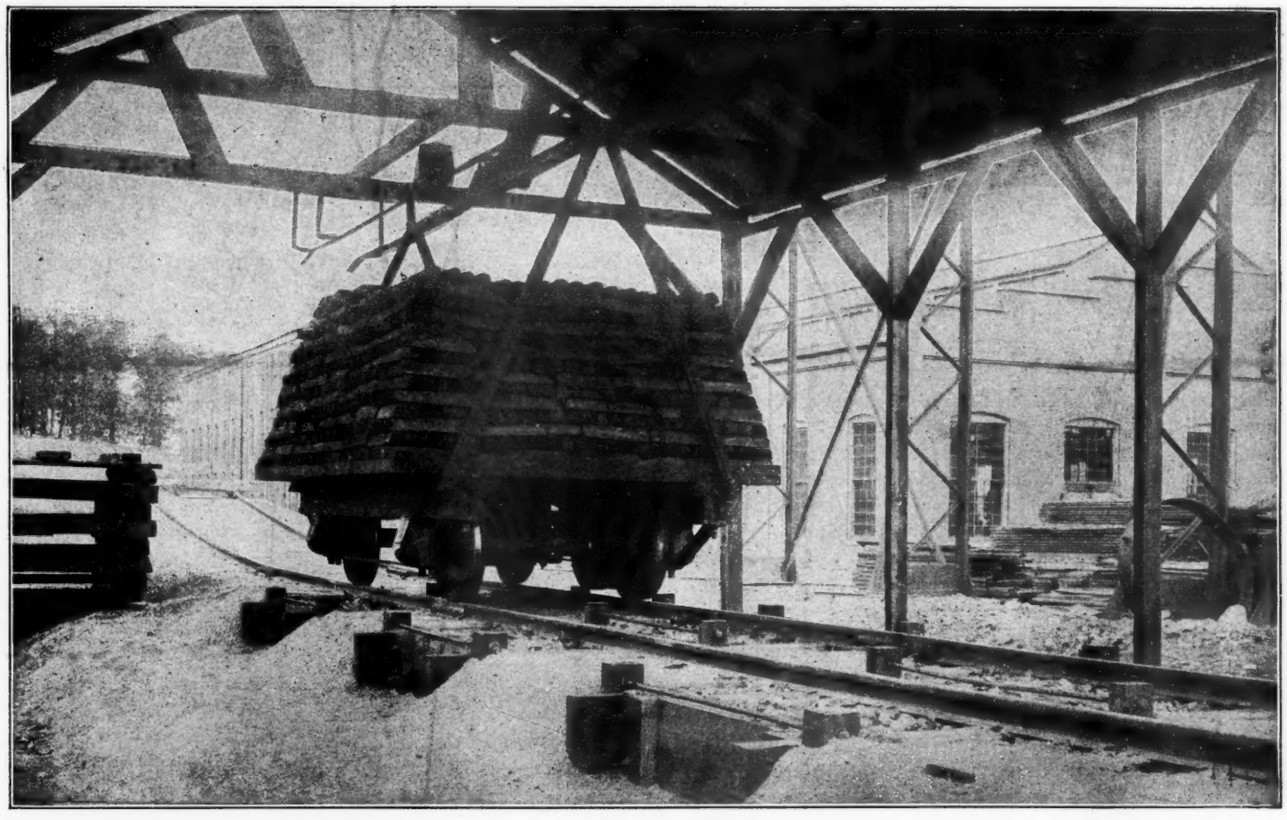
In the construction of this wall a gang consisting of one foreman at $4.50 a day; one concrete mason at $3.25 per day, three laborers at $2.50 per day, and six laborers at $2.25 per day each, was employed. The following material and labor were required for 376 sq. yds. of revetment:

Material.	
2 25-rod rolls fence wire, at 45c. per rod	$22.50
82 yds. gravel and sand, at 30c. per yd.	24.60
82½ barrels cement, at $1.70 per barrel	140.25
Total cost of material	$187.35
Labor.	
Building mixing platform	$11.50
Unloading gravel	25.00
Unloading cement	10.50
Putting up forms and placing reinforcing wire	116.50
Placing concrete	119.00
Total labor	$282.50
Total cost of material and labor	$469.85
Total cost per sq. yd.	1.25

DEPTH OF STONE BALLAST.*

A piece of single track was constructed at South Altoona foundries, under which were placed three strong boxes open at the top and having removable ends, each box being sufficiently large to contain two standard ties spaced the standard distance apart. The boxes were filled with various kinds of ballast and roadbed material. A heavily loaded truck was designed to run back and forth on the track so that the effect of its load acting through the ties upon the ballast and roadbed could be studied by the removal of the ends of the boxes, when measurements and photographs could be taken. The general arrangement of the plan is shown herewith. The track was 109 ft. in length, built of new P. R. R. standard 85-lb. rail, spiked to standard white oak ties 7 in. by 9 in. by 8½ ft. long, no tieplates being used. The rail fastenings were standard spikes, and the rail joints were so arranged as not to fall within the limits of the boxes. Eighty-five-pound rail was selected in preference to 100-lb. rail in order that the track might be sufficiently flexible to subject the ties to as much weight as possible. The ends of the track were elevated to facilitate the stopping and starting of the car, but the part over the boxes was level. The boxes were built of yellow pine planking 4½ in. thick by 8 in. wide and had floors of the same material resting on sand several inches deep, which, in turn, rested on an undisturbed shale formation. The site was selected to provide a solid bottom to prevent any appreciable settlement taking place in the boxes. The joints between the planks were not tongued and grooved nor sufficiently tight to prevent the passage of water. The boxes were strengthened by an arrangement of heavy posts and tie rods, and were spaced 12 ft. apart, center to center. Their inside dimensions were: 4 ft. 8½ in. wide, 9 ft. long and 3 ft. 4 in. high, being set so that their tops were 2 in. below the base of the rail.

The testing plant was roofed over to prevent rain from falling on the boxes so that the amount of water applied to the boxes could be accurately determined. The car or truck having two axles was designed to run back and forth upon the track at a speed of about five miles per hour. The car had a wheel base of 9 ft. and was loaded with pig iron, so that the gross weight amounted to 150,000 lbs., or 75,000 lbs. per axle. There was no spring intervention between the weight and the axle, the journal boxes being fastened directly to the body of the car. It was kept moving by an electric motor geared to one axle, the current being supplied through an overhead shoe bearing against a conductor. At the elevated ends of the track a device automatically shut off the current and reversed the motor so that the car needed very little power or attention to keep it in motion. A counter on the car registered the number of trips made.

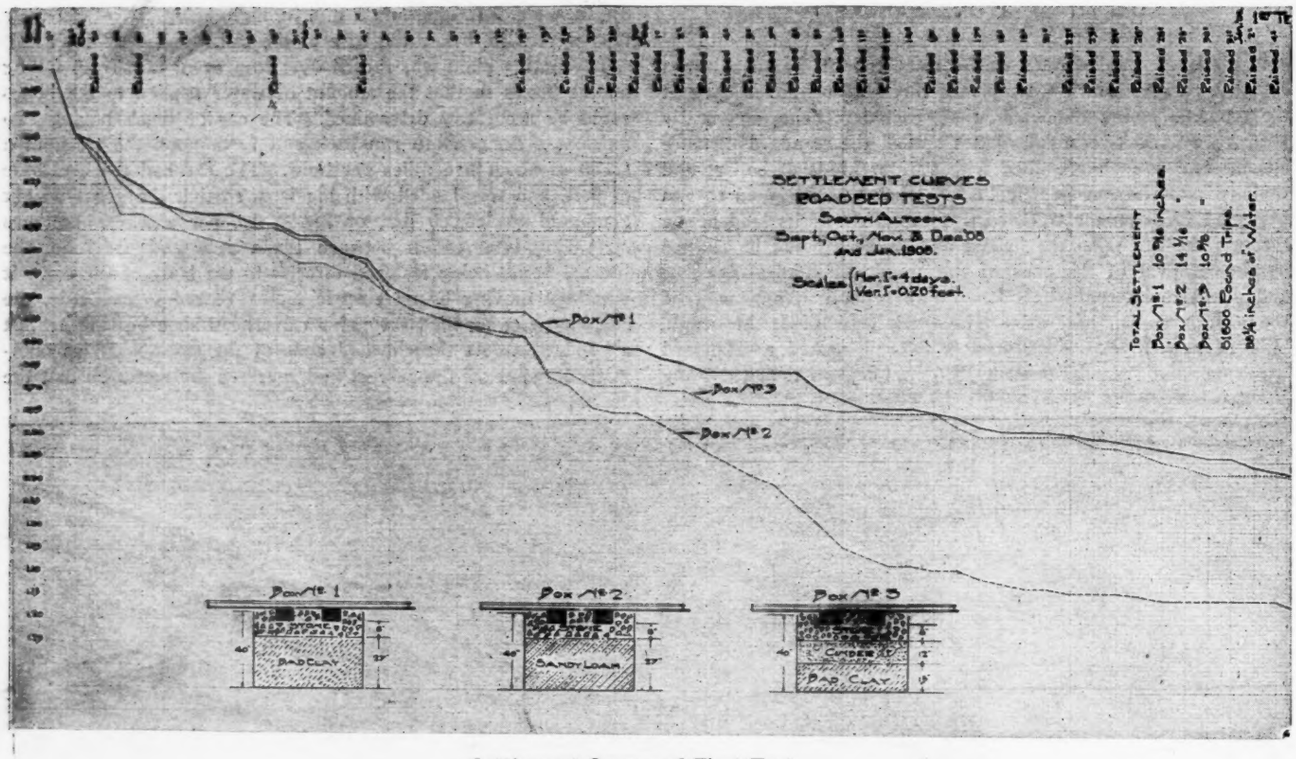


General View of Test Track Arrangement.

It being impracticable to run the car faster than about five miles per hour, at which speed any effect upon the track, due to impact alone, would be negligible, a weight of 75,000 lbs. per axle was chosen for the experimental truck, so as to obtain about the same effect on the track as an "H8b" locomotive running at the usual speed. The weight per axle for this class of locomotive is 58,100 lbs. In order to conduct the experiments as rapidly as possible the car was kept running night and day during the tests.

The running back and forth of the loaded truck over the track resulted in a settlement of the ballast and roadbed materials contained in the boxes. After a settlement was noticed, aggregating about an inch, the car was stopped and the track raised to its original elevation and surfaced by tamping the stone ballast with tamping picks according to the usual service methods, the proper elevation and levels of the track being determined by the use of a "Y" level. The truck was then started and the above operation repeated from time to time, additional

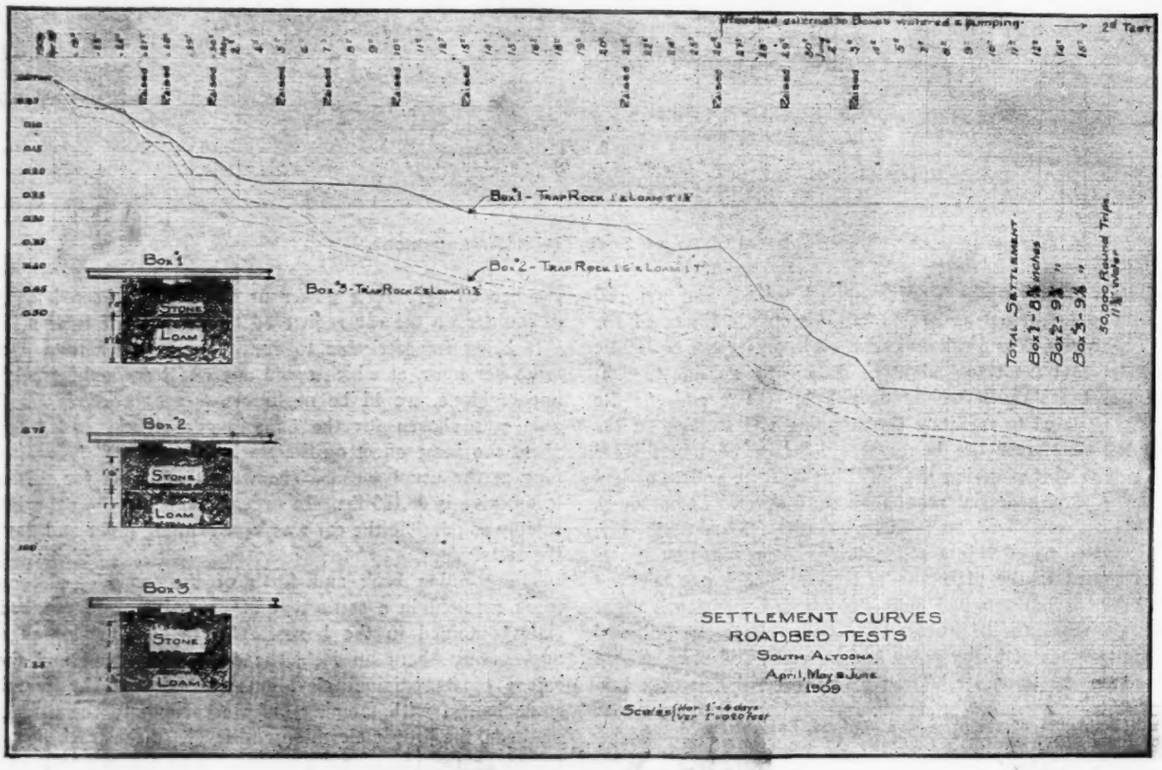
*From Bulletin 136 of the American Railway Engineering Association. Report of the General Manager's Committee of the Pennsylvania Railroad appointed to determine, by experiment, the necessary depth of stone ballast. —Committee: L. R. Zollinger, Chairman; E. D. Nelson, Allen B. Cuthbert, G. W. Snyder.



Settlement Curves of First Test.

ballast being added, when necessary, to supply the loss due to tamping and settlement. In filling the boxes in each test, the loam, clay, engine cinder or other material, except the stone ballast, was compacted by a rammer, care being taken to ram each box and each kind of material as nearly alike as possible.

The truck was kept running and the accumulated results of settlement were noted until the decrease in the daily settlement was so marked that it was considered time to close the test, when the boxes were opened and at each end three vertical sections parallel with the rail were cut in the ballast and roadbed materials; the first was taken at the end of the tie; the second half-way between the tie and the end of the rail; and the third beneath the rail. Each section was photographed, also carefully measured by the use of the "Y" level, to show the



Settlement Curves of Second Test.

curve or line between the ballast and the various materials with which each box was filled. In addition, measurements were made in the same manner of vertical cross-sections at right angles to the track under the middle of the north tie, under the middle of the south tie and midway between the two ties. In addition to this, other data was collected showing the amount of daily settlement of the rail over each box, also the the amount the track was raised each time it was tamped. The total number of trips of the car was recorded, as well as all other data that would influence the results obtained.

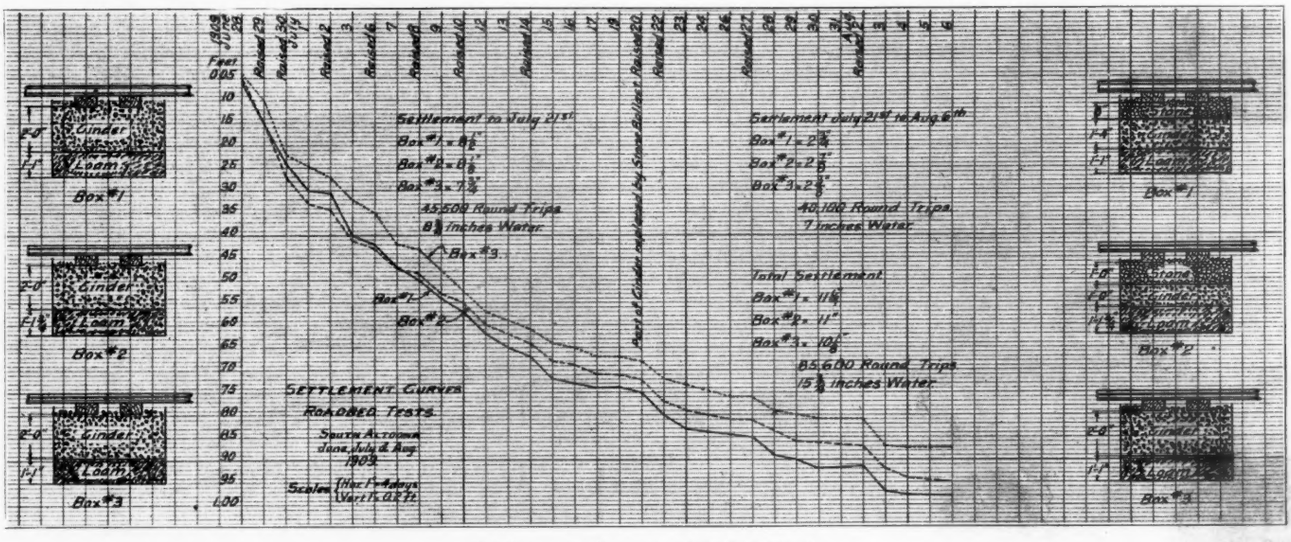
In order to simulate natural conditions as to rainfall, water in known quantities was sprinkled over each box for the purpose of wetting the ballast and roadbed materials, to induce settlement and possibly to produce pumping track, but the latter never developed. A careful record was kept showing when the water was applied and of the amount in its equivalent in inches of rainfall.

While the various tests were being conducted the ties adjacent to and between the boxes were kept slightly loose, as far as tamping was concerned, in order that the full weight of the car, in passing, would come upon the two ties in each of the three boxes. not accomplished, as the water found its way out between the cracks of the planking about as fast as it was put in.

The car having made 81,600 round trips and the track over the boxes being nearly stationary, or settling very slowly, it was decided to close the test.

The track over box No. 1 had settled a total of 10 9-16 in.; over box No. 2, a total of 14 1-16 in., and over box No. 3, a total of 10⅝ in. Water equivalent to a rainfall of 98¼ in. had been sprinkled over each box during the test. After the ends of the boxes were removed, sections and photographs were taken. An inspection of the boxes showed that in every case the depth of the ballast beneath the bottom of the tie had been materially increased, due to the compression of the roadbed material and the sinking of the ballast into the material beneath it. Further, the line of demarcation between the bottom of the ballast and the roadbed material was not straight, the ballast having formed a saucerlike depression in the roadbed material beneath each tie under each rail.

In box No. 3 the original 12 in. of engine cinder, between the bottom of the ballast and the top of the clay, are very considerably compressed, the bottom of the ballast immediately under



Settlement Curves of Third Test.

A series of five tests has been completed; the first one beginning on September 2, 1908, and the last one ending on August 2, 1910.

TEST NO. I.

In filling the boxes for the first test it was determined to use 8 in. of standard trap rock ballast beneath each tie, 8 in. of ballast being standard for single track. Beneath the ballast in one box was 27 in. of yellow clay from Neff's Cut on the middle division, which had proved itself a very bad and unstable material for roadbed purposes. In the second box, beneath the 8 in. of trap rock ballast, was placed 27 in. of good sandy loam, and in the third box, beneath the 8 in. of trap rock ballast, was placed 12 in. of engine cinder, and below that 15 in. of yellow clay, the same as in the first box. The track was then surfaced by the use of tamping picks, brought up to grade and the boxes filled with standard trap rock ballast to the top of the tie. The car was started and elevations taken from time to time to note the settlement and the track was raised, by tamping, when required, as before described.

After the car had made about 4,000 round trips, water was applied by sprinkling it equally over each box, first applying each day an amount equivalent to one-half inch rainfall. After a few days this amount was increased to 2 in. each day and continued daily for quite a period, when the amount was increased to 4 in. per day for about a week, then 8 in. per day applied for two days, in the hope of producing pumping track. This was the rail being forced about half-way through the cinder. On the other hand, the clay beneath the cinder showed very little compression, and the line of demarcation between the bottom of the cinder and the clay was quite straight, while the line between the bottom of the ballast and the top of the cinder was very much depressed under each tie.

The test showed conclusively that a depth of 8 in. of standard trap rock ballast, when laid on the usual roadbed material, was not sufficient to distribute the weight carried by the ties uniformly over the roadbed. The results in the third box showed, however, that if 12 in. of permeable material, such as soft coal engine cinder, were used beneath the 8 in. ballast, the distribution of the weight over the roadbed material was much better.

The results of the first test led to the conclusion that a second test should be conducted to determine how a depth of 12 in., 18 in. and 24 in. of trap rock ballast under the ties would behave. The experience gained from the first test suggested that better results would be obtained by using sandy loam beneath the ballast rather than yellow clay, because the first test showed that the sandy loam was more compressible than the yellow clay and that the line dividing the ballast and the loam was easier to study than the line dividing the ballast and the clay.

TEST NO. 2

The boxes were again filled, No. 1 box having 12 in. of trap rock ballast beneath the tie, with 26 in. of loam underneath it;

box No. 2 having 18 in. of ballast under the tie, with 19 in. of loam beneath it; and box No. 3 having 24 in. of ballast under the tie, with 14 in. of loam beneath it.

The car was started running on April 18, 1909, and practically the same method was pursued as in test No. 1. During the test, water equivalent to 11¾ in. of rainfall was applied. After the car had made 49,932 round trips, it was stopped on June 15, 1909, because the track over the boxes settled very slowly. The boxes were opened and photographs and measurements made.

An inspection of the boxes clearly showed that in box No. 1, having 12 in. of ballast beneath the tie, the lower surface of the ballast had been compressed a considerable distance into the loam, and that the line dividing the two was far from straight, there being a considerable depression in the line beneath each tie, especially under the rail. In box No. 2, where there was 18 in. of ballast originally under the tie, the ballast had not been driven so far down into the loam and the dividing line was much straighter. In box No. 3, having 24 in. of standard trap rock ballast beneath the tie, the amount of ballast settlement was still less and in this case, the line between it and the loam quite straight.

In test No. 2, measurements were taken to show cross-sections at right angles to the rail, one through the middle of each tie and one through the center between the two ties. An inspection of these sections will confirm the conclusion already reached, as it will be noticed the deeper the ballast, the straighter the line between it and the loam.

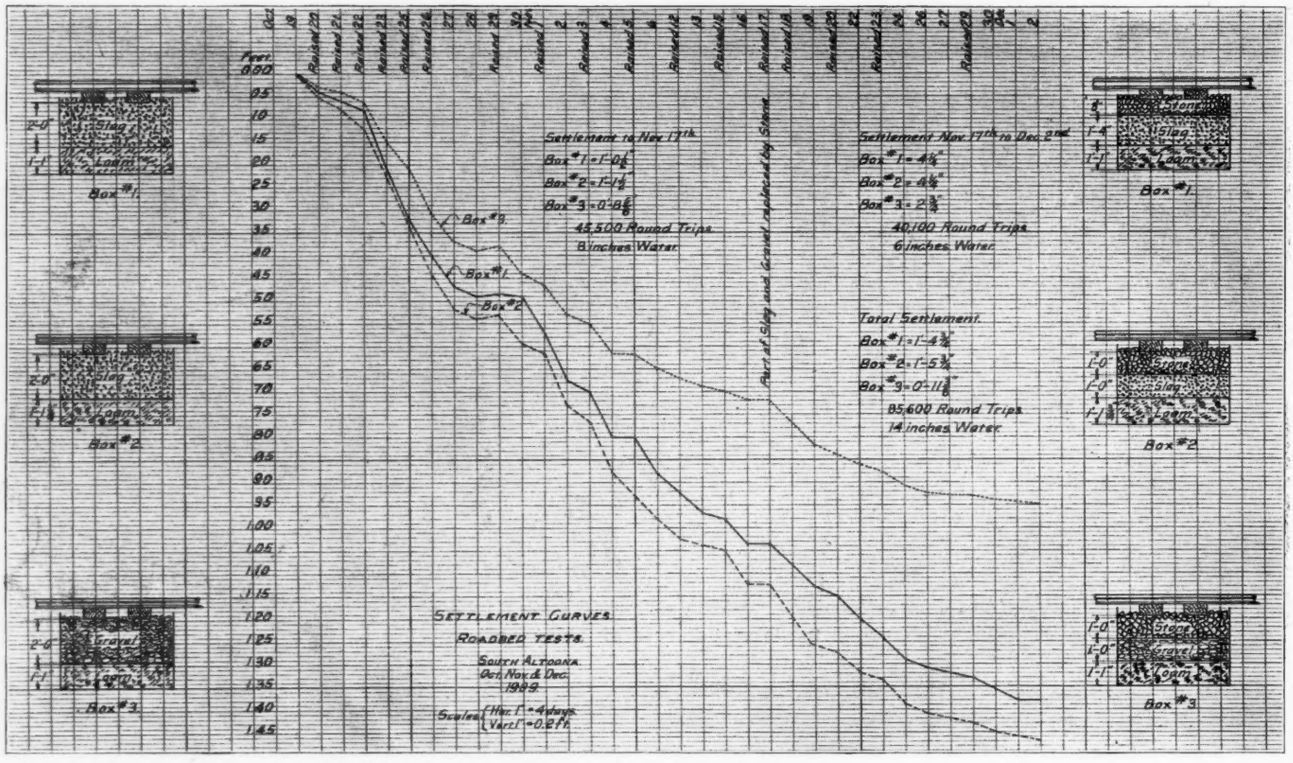
After a careful consideration of the data presented by the second test, the conclusion seems inevitable that with standard stone ballast nothing less than 24 in. beneath the tie will distribute the weight of the load uniformly over the sub-grade or roadbed. On the other hand, test No. 1 had shown that a depth of 8 in. of stone and 12 in. of cinder gave apparently fair results in distributing the weight upon the sub-grade.

TEST NO. 3.

It was therefore decided to fill No. 1 box with 24 in. of cinder beneath the ties and 12 in. of loam below that; No. 2 box and No. 3 box the same; to run a number of trips over each box and then remove from No. 1 box 8 in. of cinder beneath the tie and substitute for it 8 in. of standard trap rock ballast; in No. 2 box to remove 12 in. of cinder and substitute for it 12 in. of ballast and allow No. 3 box to remain without any change in the materials and then run a number of trips over each box. The object in running on the engine cinder before putting in the stone ballast was to compact it in a similar manner to actual service conditions when the track is first ballasted with engine cinder and later raised out of the cinder upon standard stone ballast.

No. 3 test was started on June 28, 1909, and when the car had made 45,500 round trips it was stopped and the cinder removed and stone ballast put in boxes Nos. 1 and 2. The car was then started and 40,000 round trips were made, water being applied at a rate equivalent to about one-half inch of rainfall per day until a total of 15¾ in. had been sprinkled over each box.

In the previous tests it had been noted that the water found its way through the stone ballast to the top of the clay or loam beneath it, and there collected and ran through the cracks between the planks. In making the third test a new feature was introduced in one of the boxes by placing therein, on top of the loam and beneath the 24 in. of cinder, two pieces of iron pipe perforated with many holes. Each piece of pipe sloped from the center of the box outward to the ends and a slot was made in each end of the box opposite the end of the pipe, so that it could be watched. When the test was started on June 28, 1909, water equivalent to one-half inch of rainfall was applied daily. This was in progress for nine days, until water equivalent to a total rainfall of 4¾ in. had been sprinkled on box No. 3 before any moisture appeared at the ends of the iron pipe, and then only a very small quantity of slime began to ooze out at the ends. At no time during the test did water run freely from the ends of these pipes. This was considered a very significant fact, inasmuch as it showed the ability of engine cinders to absorb and dissipate a large amount of water falling upon it before the water was able to reach the sub-grade in sufficient quantities to do much damage by saturating it. During the experiments the



Settlement Curves of Fourth Test.

pipes were carefully watched and kept clean from the inside, so that any water reaching them could be observed.

On August 6, 1909, after 85,600 round trips had been made and water equivalent to 15¾ in. of rainfall had been sprinkled on each of the boxes, they were opened, sections measured and photographs taken.

A study of the sections and photographs showed that in box No. 3, where cinder was continued the entire test and no stone ballast substituted. the line between the cinder and the loam was the straightest or best, showing the least amount of cupping, and that the line between the cinder and the loam in boxes Nos. 1 and 2 left very little to choose between them, with a difference slightly in favor of box No. 2. At the same time it should be clearly noted that the sections taken at right angles to the track show the ties bent more in box No. 3 than they did in either boxes No. 1 or No. 2, due to the fact that engine cinder is more compressible than broken trap rock.

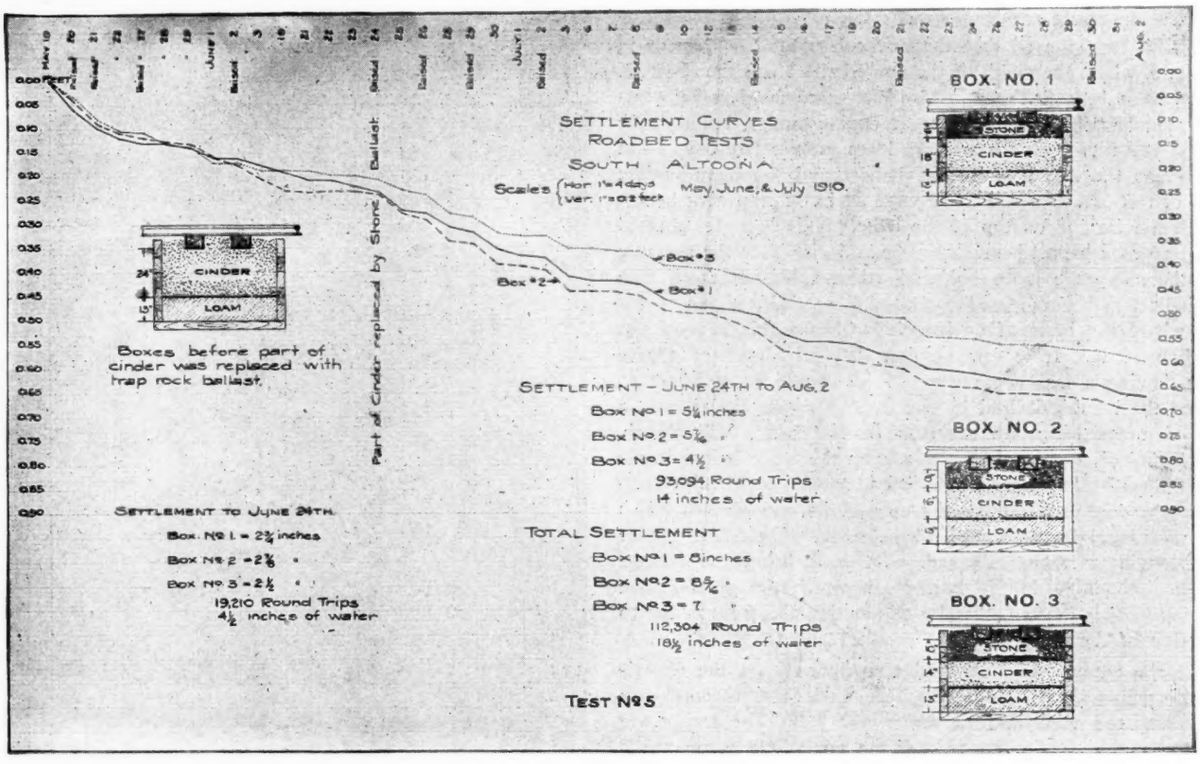
A study of the lines of demarcation, between the trap rock ballast and engine cinder in boxes No. 1 and 2, develops that there was less deformation or cupping of the cinder beneath the ties where the depth of stone ballast had originally been 12 in. in box No. 2 than where 8 in. in box No. 1.

TEST NO. 4.

It was determined upon the conclusion of test No. 3 that it would be well to test two other materials available for use as sub-ballast, namely, granulated slag and gravel, to see how they would compare with engine cinder under similar conditions. Therefore test No. 4 was started, boxes Nos. 1 and 2 having 24 in. of granulated slag under the ties and 12 in. of loam beneath that; box No. 3 having 24 in. of a sandy New Jersey gravel procured along the Bonhampton branch of the New York division. After the boxes were filled practically the same method was pursued as in test No. 3. It was noted that the compressibility of gravel was about equal to that of engine cinder, while that of granulated slag was much greater.

After 45,561 round trips had been made by the car, boxes Nos. 1 and 2, respectively, had 8 in. and 12 in. of trap rock ballast put in beneath the ties and on top of the granulated slag, while box No. 3 had 12 in. of standard trap rock ballast put in on top of the gravel. The car was again started and run for 40,060 round trips. After a total of 85,621 round trips had been made and water equivalent to 14 in. of rainfall had been sprinkled over each box, the car was stopped, the boxes opened, sections measured and photographs taken.

This test developed the superiority of gravel when used for sub-ballast, as compared with granulated slag, the granulated slag being much more compressible and unstable than the gravel. There was little difference, however, in the line dividing the slag and the loam, and the gravel and the loam. This would seem to indicate that neither material had much advantage over the other in distributing the pressure upon the loam. A further study of this line showed that in box No. 2, where, during the latter half of the test. there were 12 in. of trap rock ballast beneath the tie, the line between the slag and the loam was a trifle better than where there were only 8 in. beneath the tie in box No. 1. An inspection of the line, dividing the trap ballast and slag in boxes Nos. 1 and 2, and the ballast and the gravel in box No. 3, showed that there was more cupping or deformation where the ballast was only 8 in. deep beneath the tie on top of the slag than where it was 12 in. deep beneath the tie on top of the slag or gravel. Further, the line in box No. 3, between the trap rock ballast and the gravel, was still better than between the stone ballast and the slag in box No. 2. This is also confirmed by an inspection of the sections taken at right angles to the track.


SETTLEMENT CURVES
ROADBED TESTS
SOUTH ALTOONA
Scales { Hor 1"=4 days / Ver 1"=0.2 feet
May, June, & July 1910.
Box #3
Box #2
Box #1
Part of Cinder replaced by Stone Ballast
BOX. NO. 1
STONE
CINDER
LOAM
Boxes before part of cinder was replaced with trap rock ballast.
SETTLEMENT - JUNE 24TH TO AUG. 2
Box No 1 = 5¼ inches
Box No 2 = 5¼ "
Box No 3 = 4½ "
93,094 Round Trips
14 inches of water
BOX. NO. 2
SETTLEMENT TO JUNE 24TH.
Box. No 1. = 2¾ inches
Box No 2 = 2⅞ "
Box No 3 = 2½ "
19,210 Round Trips
4½ inches of water
TOTAL SETTLEMENT
Box No 1 = 8 inches
Box No 2 = 8⅛ "
Box No 3 = 7 "
112,304 Round Trips
18½ inches of water
BOX. NO. 3
TEST No 5

Settlement Curves of Fifth Test.

TEST NO. 5.

The data obtained from all of the tests up to this point indicate that the greater the depth of trap rock ballast, beneath the tie, at least to a depth of 24 in., the less deformation there is in the line dividing the trap rock ballast and the material directly beneath it, the best results in this respect having been shown with a depth of 24 in. of trap rock ballast beneath the tie in box No. 3 of the second test. This brought forward the proposition whether it would be possible, by a combination of trap rock ballast and engine cinder, having a total depth of 24 in., to get

as good a distribution of weight or pressure on the loam as was obtained by a depth of 24 in. of standard trap rock ballast alone. And, further, would such a combination of standard trap rock ballast and engine cinder show too much deformation of the line separating the stone and the engine cinder?

To determine this, if possible, test No. 5 was started with 24 in. of engine cinder beneath the ties on top of 13 in. of loam in each box. The car was started running on May 19, 1910, and 19,210 round trips made to compact the engine cinder until the daily settlement of the cinder amounted to very little. On June 24, 1910, the car was stopped and 6 in. of standard trap rock ballast were placed beneath the ties in box No. 1; 8 in. beneath the ties in box No. 2, and 10 in. beneath the ties in box No. 3. The ballast was tamped with tamping picks as in all the previous tests. The car was run until a total of 112,304 round trips had been made and water equivalent to a rainfall of 18½ in. had been sprinkled over each box. On August 2, 1910, the car was stopped, the track having, for several days prior, shown very little settlement. The boxes were opened, and the usual measurements made and photographs taken.

The fifth test showed that there was less total settlement in box No. 3, where the depth of the stone ballast was the greatest, namely, 10 in. beneath the tie. Also that there was less deformation or cupping between the line of engine cinder, but the line between the engine cinder and the loam in box No. 3 was not as good as the line between the ballast and the loam in box No. 3 of test No. 2, where there were 24 in. of trap rock ballast beneath the tie and on top of the loam. This indicates that 24 in. of trap rock ballast beneath the tie will distribute the pressure upon the sub-grade more uniformly than a like depth of trap rock ballast and compressed engine cinder combined, up to the point where the layer of engine cinder has a thickness of not less than 14 in. It is our opinion that any layer of engine cinder, having a less depth than 14 in., would be sufficient to produce the results desired by the use of engine cinder, viz., a layer of material beneath the stone ballast which will absorb, lead off and dissipate water falling upon the track before it can reach the roadbed proper in sufficient quantities to be injurious.

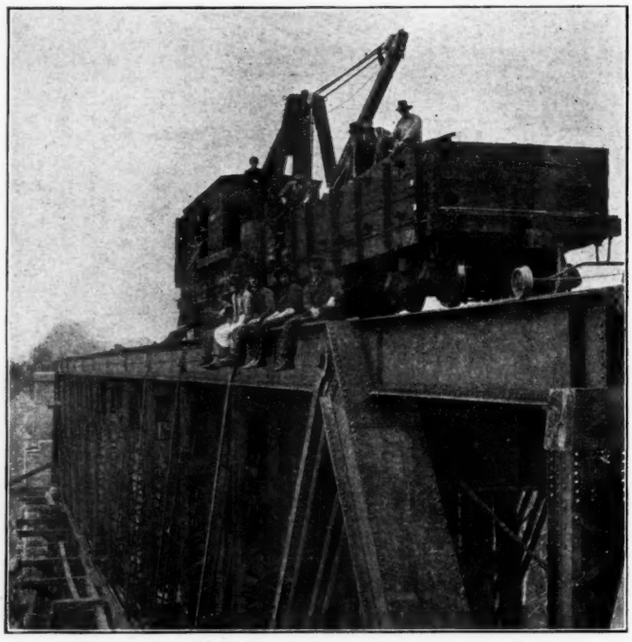
A depth of 24 in. of standard trap rock ballast, beneath which is an additional layer of mat, 24 in. thick, of good permeable material, will place our sub-grade at a depth below the average frost line obtaining in the latitude in which the greater part of our system is located, thereby eliminating the trouble due to the action of the frost upon the roadbed and track.

Since the amount of wear and tear imposed on the experimental track and sub-soil during the various tests was very small compared with that to which our main line tracks are subjected under service conditions, the committee recommends the use of 24 in. of stone ballast underneath the ties to meet satisfactorily the conditions that exist today and which will probably become more severe as time goes on, and that in addition to the 24 in. of trap rock ballast beneath the ties, there should be provided a layer of engine cinder, gravel or an equivalent, to act as an absorbent mat to promptly and properly dispose of the water falling on the track in such a manner as to prevent its softening the roadbed material. Where the material forming the roadbed is of poor quality, the mat of engine cinder or gravel will also prove advantageous to prevent its working up into the ballast, thus shutting off drainage.

The work on the bridges of the Antung-Mukden Railway, Manchuria, is progressing rapidly. The total length of the bridges will be upward of 20,000 ft., the longest being 1,830 ft. Most of the iron bridges are of American make, while the rails are Japanese. Although the rail-laying work was interrupted by the severe cold last winter, over 20 miles have been completed since November last, only 84 miles of track remain to be finished. The Yaul river bridge may also be finished and an uninterrupted journey made possible from Mukden to Seoul by November 3.

DERRICK CARS IN MAINTENANCE WORK.

Several divisions of the Pennsylvania Lines West of Pittsburgh have in service derrick cars built by the local maintenance of way forces, of which the one used on the Louisville division is typical. This car has been found almost indispensable on account of the saving in time and labor on a great many classes of maintenance work. The car shown in the accompanying photograph was made in the Louisville division shops by mounting a single drum hoisting engine on a flat car and fitting up a frame mast and boom. The boom is 26½ ft. long, allowing it to reach to the center of a flat car, coupled to the derrick car, and is removable, so that in transit it can be carried in brackets alongside the house. In the rear end of the car are coal bunkers and water tanks, carrying supplies for 48 hours' service. As the engine has but one drum the boom is raised and lowered by hand, and the swinging is accomplished by a hand lever, clamped to the mast and revolving with the mast and boom. For moving the car for short distances, as is necessary in backing on to sidings to allow regular trains to pass, a 250-ft. anchor line is used. One of the regular tongs, carried with the car, is attached to angle bars or ties in the track as



Derrick Car Used on Pennsylvania Lines West.

far ahead as the line will reach, and by winding up the line on the drum the car is pulled ahead.

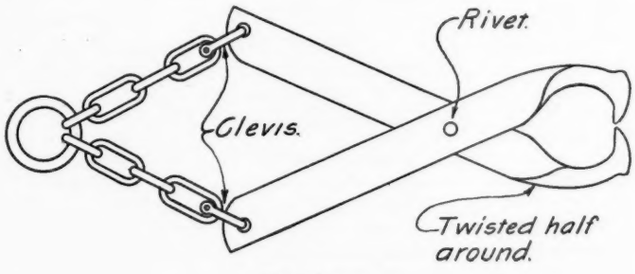
Practically all the rail used on the division is handled with this car. In unloading or picking up from the main track a force of seven men can do the work, which requires 18 when the rail is handled by hand. For picking up rail the tongs shown on the following page are used. These tongs have practically displaced more complicated types. They can be made from two old switch rods rivited together and the ends twisted to form points.

In laying side tracks a storage yard is established at one end of the work, where all material is held until needed. It is loaded on a flat car by the derrick, the rails and ties being piled in alternate tiers and a second car loaded with joint material, spikes and surplus tools. The work train engine then pushes the derrick car and these material cars ahead on the new track, and the material is unloaded at the front end ready for laying. It has been found that one carload lays about 300 ft. of track.

When renewing ties the trackmen assemble the old ties in piles of nine and these are loaded into gondolas by the derrick car and hauled into the division terminal to use for engine wood.

This use of the derrick saves several men as compared with the practice of loading the ties by hand. A pair of tongs similar to the ones shown in one of the illustrations is used for handling ties.

In building trestles on new tracks the derrick car is kept at hand to raise bents and handle stringers, relieving the bridge gang of practically all the heavy lifting usually required in this work. In renewing trestles under traffic wherever a side track is convenient, or the size of the job justifies the construction of a temporary side track, the car is also used. In erecting plate girders, spans of 30 ft. or under are readily unloaded and placed with this car. Heavier ones require the services of the steam wrecking derrick, or if that is not available they must be unloaded by hand, but in any event the derrick car is usually called into service to unload the floor beams and stringers. In erecting truss bridges a temporary side track is built adjacent to the work and the derrick car unloads all members from this side track, handles them to the bridge location under its own power and takes care of all handling required during erection. This does away with the heavy expense of a traveler and of keeping the work train in service, as would be necessary without the derrick car. The accompanying photograph shows a deck struss 231 ft. long erected by the car. This bridge replaced a Howe of 150 ft. span, the widths of the two trusses being such that the new one was erected outside of the existing Howe span. The car has been found very convenient in erecting overhead bridges, as all members can be placed direct from the car without false work.



Tie Tongs.

In setting signal posts for an automatic signal installation, a work train was fitted up, with the derrick car, a car of concrete materials and a car containing the signal posts. The holes to contain the foundations for these posts had been excavated previously, and at each location it was only necessary to pick up the post with the derrick car, swing it into place, and hold it in a vertical position while concrete was placed around its base. This work required two signal men, five men in the concrete gang, three carpenters to set the forms, the signal supervisor and the division engineer, in addition to the train crew. With this force 14 automatic signals were placed in one day. Signal bridges and overhead cranes have also been erected with the derrick car.

When masonry work is to be done the derrick car is first used to unload the hoisting engine and other equipment used on the ground, and to raise and hold the derricks while they are being guyed. In cases where the masonry is located under both a main and side track the derrick car is left on the side track during working hours and serves as a hoisting engine and derrick, saving the expense of erecting and dismantling a hoisting engine. When only a few defective coping stones are to be replaced at one location the work can be very readily done with the derrick car. In one case the end of a truss bridge was carried on packs while the old stone was removed and new stone placed between trains.

By using the derrick car for unloading and placing sections of cast iron pipe culverts the time consumed can often be made so short that the work can be done from local freight trains. In one case on this division, when the main track was being lifted, a dry wall about 300 ft. long was required to prevent the encroachment on a public road. In this case the derrick car was set off on a side track built for the purpose and the wall was built by working from one end, unloading the material direct from cars on the main track alongside. The derrick car also handled all the stone for extending two bridges within the limits of this wall, eliminating the necessity for stationary derricks. When not in use on the road the derrick car is kept at the storehouse available for use in handling heavy material of all classes.

HANDLING CEMENT SACKS.

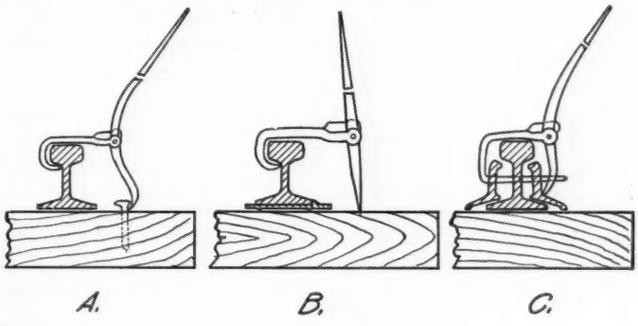
The handling of empty cement sacks has been the subject of a great deal of discussion by the railways for several years. Recently uniform rules regarding the handling of such sacks have been put in force throughout the entire country. These rules require, among other things, that each bundle of sacks shall be securely tied with not less than three separate wire ties or three separate ties of rope, the latter to be at least 3/16 in. thick. Also each bundle shall be marked with a linen tag showing name and address of shipper and consignee, the tag to be securely fastened to the bundles by wire. Freight must also be completely prepaid. In western territory the tariffs have contained the provision to the effect that if bundles were not tied and tagged in accordance with these rules, double freight should be charged. This provision has been found unsatisfactory, for the double freight charges do not compensate the roads for the loss and expense they sustain by reason of defective shipments being broken up and losing their identity in transit. A movement is now under way to refuse to accept shipments unless they are properly bundled and tagged.

THE HANDY BAR.

BY W. E. DAVIN.

Supervisor Roadway and Track, Pittsburgh & Lake Erie, McKees Rocks, Pa.

This bar is somewhat similar to the monkey bar described in our issue of June 16, and is now in use on the Pittsburgh & Lake Erie, where it has been found to work very satisfactory and to result in a saving in labor. It is made in three types, as shown in the sketch. Type A is used to force the rail into place against the spikes when renewing rail. Style B is used to hold the rail to gage where tie plates are being applied, or where there are no spikes in the ties, while type C is used to draw the angle bars into place in order that the bolts may be easily applied.



The Handy Bar.

About 9,000 ft. of concrete drainage ditches are being constructed along the base of small ravines and gulleys at Empire, Canal Zone, to carry off storm water during the rainy season. These drains are built to established lines and grades, and are expected to do away with the necessity of removing obstructions and cave-ins which are now constantly filling the ditches.

General News Section.

The commission to investigate second-class postage rates, Justice Hughes, chairman, has postponed its first public hearing (at New York) until August 1.

The government has begun suit in the United States District Court at Grand Rapids, Mich., against the Grand & Indiana to recover penalties for a violation of the hours-of-service law.

The government has entered suit at St. Louis, Mo., against the St. Louis, Iron Mountain & Southern for violation of the hours-of-service law, in working a fireman twenty-three hours.

The shopmen of the Louisville & Nashville, at Decatur, Ala., to the number of 1,850, have had their pay increased 5 per cent., beginning with July 1.

The executive offices of the New York Central fast freight lines were moved on July 15 from Buffalo to Chicago. The clearing house and the offices of the car accountant will remain in Buffalo.

In the Criminal Court at Jersey City, N. J., fines amounting to $4,950 have been imposed on the Pennsylvania for maintaining a soft coal smoke nuisance, and of $3,650 on the Erie for a similar offense. The roads will appeal.

At Brussels, Belgium, July 17, Mr. Olieslager, in a monoplane, flying around the aerodrome, traversed a distance of 388 miles without a stop. This distance is said to be twenty-six miles farther than has ever before been thus made in a flying machine.

The 41,000 employees of the Missouri Pacific system have been strongly urged in an address issued to them by President B. F. Bush to co-operate with the management to prevent waste of material and labor, and establish better relations between the road and the public.

Employees on all parts of the Atchison, Topeka & Santa Fe have subscribed to a fund to pay for the erection at the Topeka Kas., cemetery of a granite obelisk monument 40 ft. high in memory of James E. Hurley, formerly general manager of the Eastern lines, with headquarters at Topeka.

A robber who attempted to hold up the passengers in a sleeping car on an eastbound train of the Chicago & North Western Railway Company, near Tama, Iowa, on the night of July 17, was himself held up by the brakeman, who had a revolver and ordered the bandit to surrender. The brakeman had to shoot him, however, and he had to be taken to the hospital.

Representative Talcott of New York has introduced in Congress a bill prohibiting the running of wooden cars between steel cars in passenger trains after January 1, 1912. The intent of this bill appears to be to apply to the whole of a passenger train, the legal restriction against the use of wooden cars between steel cars which now applies to mail cars only.

The Oregon State Railroad Commission proposes to proceed in the courts against the Oregon Electric Railway Company for keeping a station agent on duty more than nine hours at a time, in violation of the state labor law. The railway company denies the power of the state to act in this matter, contending that the regulation of the commission is an attempt to interfere with the Federal law on the same subject.

The Pennsylvania Railroad has begun suit at Harrisburgh, Pa., to contest the constitutionality of the full-crew law of Pennsylvania, passed on the 19th of June, last. The company has filed a bill in equity declaring the law to be unconstitutional and void, because it is not a valid exercise of the police power possessed by the legislature of Pennsylvania; is in violation of the terms of the constitution prohibiting special laws requiring labor; is confiscatory in character and repugnant to the constitution of the United States, because it would interfere with interstate traffic.

The Railway Commission of Canada has issued an order requiring all railways, within 60 days, to file statements describing their locomotives, particularly with reference to ashpans, and whether it is necessary for a man to go under the engine to clean out the pan. Another order has been issued requiring that where an accident occurs at a highway crossing, a watchman must be immediately assigned to that crossing and kept there until the commission has made an investigation; and this applies to every crossing at which a person has been killed or injured since January 1, 1905.

So small a thing as a fire in a wooden overhead highway bridge blocked the main line of the Pennsylvania last Sunday night for several hours. The bridge spanned the four main tracks at Gap, east of Lancaster, and some of the timbers had fallen to the track before the section men arrived on the scene. There was no water near and the men had to extinguish the fire by shoveling earth upon it, but before this was accomplished some of the rails had been warped by the heat so that the restoration of the track took some time. Through passenger trains were sent from Parkesburg to Harrisburg, and vice versa over the freight line, by way of Columbia.

The special committee appointed by the National Association of Railway Commissioners to study the express rate situation throughout the country is composed of the following members of the different state commissions: C. F. Staples, Minnesota, chairman; Martin S. Decker, New York; O. P. Gothlin, Ohio; H. S. Erickson, Wisconsin; L. B. Finn, Kentucky; E. S. De Pass, Arizona, and O. F. Berry, Illinois. On July 27 a session of the committee, which it is expected will last several days, will begin at Chicago, during which officers of railways and express companies as well as shippers and citizens generally are invited to furnish information and offer suggestions to the committee.

The electrification commission of the Chicago Association of Commerce will consider at its meeting on July 28 the advisability of sending a number of representatives of Chicago firemen's brotherhoods to London to study English methods of stoking, which, according to President S. M. Felton of the Chicago Great Western, who returned a short time ago from a visit to London, are far superior to the methods of American firemen. Mr. Felton tells his neighbors in Chicago that the smoke nuisance could be practically eliminated if the best methods of firing were employed, and it is thought that English ideas would be taken up by American firemen more readily if they learned of them through members of their own brotherhoods than through higher officers of the roads.

In an appraisal being made by the state tax commission of Ohio of railway property in the state, the following increases in valuations have been made for purposes of taxation: Hocking Valley from $7,400,000 to $40,659,900; Norfolk & Western, $7,017,000 to $28,002,400; Wabash, $2,361,081 to $8,794,000; Toledo, St. Louis & Western, $1,360,158 to $3,732,100; Ann Arbor, $121,027 to $292,500; Louisville & Nashville, $205,625 to $462,700; Chesapeake & Ohio of Indiana, $147,684 to $419,900; Bessemer & Lake Erie, $328,355 to $789,600; and Ashland & Western, $38,687 to $186,300. A valuation of $873,700 was fixed on the Cincinnati, New Orleans & Texas Pacific, the only Ohio property of which is a terminal a little more than half a mile in length. Several of the roads have protested against the increases in their valuations.

The legislature of Wisconsin has passed a radical employers' liability law. An employers' liability law is before the legislature of Massachusetts. It is known as the Saunders-Parks bill. In principle it is similar to laws which have been adopted in other states. It forbids an employer to offer as defense in a suit for damages for personal injuries in industrial occupations a claim that the employee was negligent or that he had assumed the risk, etc.; but if an employer join the insurance association provided for by the law then these changes shall not apply. Detailed provision is made for the incorporation of the "Massachusetts Employees' Insurance Association" in which employers may insure. It is expected that employers, to avoid the increase in risk which will be imposed upon them if they do not join the association, will elect to join. Having joined, they are subject to a schedule laid down in the law, providing for weekly payments to disabled employees.

The New York, Westchester & Boston, which expects to run trains the coming autumn from New York City northeast to Mount Vernon. and which has its southern terminus at 177th

street, in the borough of the Bronx, has contracted with the Harlem River & Port Chester for the use of its tracks from 177th street southward to the terminus of the H. R. & P. C., at Willis avenue. At the same time arrangements are being made for the construction of a large passenger station at 180th street for transferring passengers to and from the elevated and subway lines of the Interborough Rapid Transit Company. Thus it appears that the Westchester road may run its trains through to Willis avenue (the Harlem river terminus of the New Haven road) and that passengers to or from the Interborough lines will have to change cars at 180th street. The Harlem River & Port Chester is the Harlem River branch of the New Haven road. The Westchester road also is controlled by the New Haven.

At the request of a representative of the Brotherhood of Railroad Trainmen, E. W. Major, attorney-general of Missouri, has written a letter giving his interpretation of the law requiring railways in Missouri to make semi-monthly payments of wages, which was passed at the last session of the legislature at the instance of railway employees. The Missouri, Kansas & Texas made payments for the first 15 days of June on July 1, by which practice it will hold back at all times from 15 days' to a month's pay, and the employees have complained against this. According to Mr. Major's interpretation, the law means that payments shall be made in full twice a month and that at no time should the railway be indebted for more than 15 days' service to its employees. An officer of the road stated that it would be a physical impossibility to comply with the attorney-general's interpretation, as it is out of the question in one day to make out payrolls, compute time, deduct for board, make out checks sign checks, mail checks, etc., for men scattered all over the country. He indicated that while it might be done in a day or two less than half a month, it takes practically all of that time.

Variations: By the Press Agent.

The Southern Pacific Company is endeavoring to keep track of its patrons. To aid in the expeditious handling of excursion travel and holiday traffic, men go through the trains leaving large cities, and give cards to passengers, requesting them to write the station from which they expect to return and the time of the intended departure. . . . One passenger returned a card with a postscript to the passenger traffic manager, informing him that he was a "wise old guy." One woman wrote that she would return from any station which suited her best and at the time she chose. But most of the cards contained brief answers and to the point, giving the information desired.—*Sacramento Bee.*

Abandonment of 130 Miles of Railway.

The National Railways of Mexico has abandoned 130 miles of main line track, extending from Matamoros, state of Coahuila, to Sauceda. This division was formerly a part of the Mexican International main line from Piedras Negras to Durango. When the National Railways of Mexico absorbed that property and also took over what were formerly known as the Monterey & Mexican Gulf and the Coahuila & Pacific roads it found itself in possession of three parallel lines running between Monterey and Torreon. The three lines have all been operated at heavy and unnecessary expense and the abandonment of one of them was decided upon to remedy the situation. The track is now being taken up and the rails will be used for the construction of extensions in some other part of the country. It is reported that other paralleling and useless lines belonging to the system will soon be abandoned and the tracks removed. One of these stretches of track is that of the old Mexican Central line running between Celaya and Mexico City, 181 miles. For this distance the road closely parallels the former main line of the Mexican National. By abandoning that part of the division the cost of maintaining two stations in many of the towns, as well as the heavy expenses of keeping up the useless tracks will be done away with.

Some Results, Possibly, of Industrial Trains.

Eleven southern states will this year for the first time grow 100,000,000 bushels of corn, in addition to having a cotton crop worth in prospect more than $1,000,000,000. The corn crop will come nearer making that section self-sustaining than in any preceding year. Since 1906 these eleven states have increased their area in corn from 33,015,000 to 41,328,000 acres, or 25.5 per cent. Of this rapid gain, amounting to 8,313,000 acres, fully one-fourth of it has been made by the two states of Mississippi and Louisiana. As these are the states in which, apart from Texas, the boll weevil has been most destructive, it is evident that the loss in cotton acreage has to no small extent been made good by the expansion in corn. In fact Louisiana for the first time last year actually exported corn into other states.

The extent to which this tendency to enlarge corn acreage has advanced in these states is shown by the following comparison of acreage in 1906 and in 1911:

	Acres in Corn, 1911.	Acres in Corn, 1906.	Inc. 5 Yrs. Acres.
Texas	9,240,000	6,925,000	2,315,000
Georgia	4,577,000	4,339,000	238,000
Kentucky	3,703,000	3,195,000	508,000
Tennessee	3,683,000	3,075,000	608,000
Alabama	3,665,000	2,990,000	675,000
Mississippi	3,329,000	2,204,000	1,125,000
North Carolina	3,072,000	2,732,000	340,000
Arkansas	2,884,000	2,237,000	647,000
Louisiana	2,518,000	1,524,000	994,000
South Carolina	2,515,000	1,935,000	580,000
Virginia	2,142,000	1,859,000	283,000
Total	41,328,000	33,015,000	8,313,000

Several important results are sure to flow from this development. Not only will there be less need for the southern states importing so much corn from the West as usual, but the outlay formerly made for this purpose will be available for other uses. A second advantage of the change to greater independence in this respect will be the introduction of a rotation system into the methods of farming, whereby both the soil and the system of farming will be benefited. In addition to these must be mentioned the more careful cultivation which corn growing requires —a benefit which must in due time be imparted to other crops as well.—*Wall Street Journal.*

Railway Valuation in Japan.

Railways in Japan are owned by the government. Soon after the Russo-Japanese War a bill termed the railway naturalization law was introduced in the Diet, providing for the state purchase of all railways within ten years. As a matter of fact, the purchase was effected within 18 months, the capital invested exceeding $210,000,000. Several smaller companies, totaling some 450 miles, were not included. The price to be paid was determined as follows: Twenty times the average of the net profits for the years 1902, 1903 and 1904, divided by the original cost of construction and multiplied by the cost of construction at the date of purchase. It will be evident that roads paying a good dividend got a good price from the government, and roads not paying a dividend were sold at a sacrifice. Dividends are a more or less elastic thing. For instance, when the Tokyo street railway last year wanted to sell to the government they were paying 6 per cent. dividends according to the sheets produced. The governmnt could not consider the proposition for the purchase at that time. Later the street railway management appeared before the government with a bill asking that they be allowed to increase the fare. At that time their balance showed little or no dividend. High finance has reached Japan.—*James F. Paige,* before New England Railroad Club.

The P. R. R. Porter.

William H. Ridgway, of Coatesville, Pa., a teacher of Bible lessons, writing in the *Sunday School Times* and discussing the doings of King Josiah, 621 B. C., preaches a little sermon on the word "All"—as follows:

All that was committed to thy servants, they are doing (v. 16). All. Not just some things. Bosses want that kind of help. Clients that kind of lawyers. Railways that kind of trainmen. There got on the train the other day with me a stolid foreign laborer with a 98-cent dress suit case. He put it up in the rack. When we approached Philadelphia the colored porter, which the Pennsylvania Railroad employs to look after *"All"* passengers, came and politely took down the poor suitcase and placed it by the side of the Hunkey. The foreigner would not have been more surprised had the porter struck him a blow in the face. And then you ought to have seen him smile as he appreciated the unexpected and perhaps rare attention. It made him happy.

When the porter came back I congratulated him on his courtesy to the Hunkey. This made the porter smile. He was happy. The foreigner was happy. I was happy. We three. I joined a dinner party of nine in Philadelphia and told them about it. They also smiled with pleasure. Twelve were happy. I am now telling 100,000 about it. Do you smile? And all because a humble porter did *"All"* that was committed to him. "He that is faithful in a very little is faithful also in much: and he that is unrighteous in a very little is unrighteous also in much."

Twelve Passengers Killed at Muehlheim, Germany.

Press despatches of July 17 report the derailment at Muelheim Baden, Germany, in which twelve persons were killed and a large number injured. The train was an express passenger from Basel, Switzerland, to Berlin, Germany. The engine ran off the track as the train was entering the station; cause not given. A part of the train fell against another train that was standing on an adjacent track.

Railway Travel in Japan.

After a day at Kobe, I engaged accommodation on the night express for the Kure naval station, some 200 miles distant.

This night we had our first experience in a Japanese sleeping-car. The track is narrow gage, and the standard sleeping-cars have six seats running lengthwise, each seating two passengers, with a center aisle. The upper berth is the regular Pullman style, and a section will accommodate two passengers. The night was during the extreme heat of mid-summer, the car was crowded, and in addition to the regular curtains each berth was provided with a "mosquito bar," which added to the general discomfort. Passengers were taken on and let down at all stops, so there was a constant procession through the aisle all night. Part of the car was reserved for local accommodation, and those who sat up smoked incessantly, so that long before morning the atmosphere became intolerable. There are no exclusively smoking-cars in Japan.

At the stations the click-clack of the wooden shoes of the people, walking along the concrete platforms, together with the noisy calls of the vendors of tea and lunch, combined to disturb even a sound sleeper.

When the Japanese travels he intends to have some of the comforts of home. He carries a sleeping outfit, one or more blankets, and a pillow that he can fill with air; and at every stop he gets a lunch of some kind. Tea is served in little teapots. For a couple of cents you can get a teapot with tea and enough hot water to make several cups full, and also a small cup, hardly as large as an after-dinner coffee cup. When the traveler drinks his tea he throws the crockery ware out of the window.

Following the custom that obtains in all Japanese houses, many passengers remove their shoes upon entering the train, and about the first thing the porter does after you are seated is to produce a pair of slippers.

The Japanese porters are exceptionally attentive, always on hand, will secure lunches, fruit and papers at any station on request, send telegrams, and are ever ready to assist, even to buttoning a lady passenger's shirtwaist up the back. The extremely low charge of one cent per package carried, which is the limit the law allows, places their services within the reach of all travelers, and needless to say, they are well patronized. I may say that Japanese travelers are proverbial for the number and variety of packages and hand luggage they carry when traveling, and in fact, man's position and standing is not infrequently judged from the extent of his baggage. I have seen one man with actually fourteen separate pieces of baggage and some of them were almost as large as a small steamer trunk. When you get to the station the porter will take charge of your baggage; it need cause you no further anxiety. He will watch it till the train comes, and then put it on board. The train boy will place it under the seat or wherever he can. These train boys show a wonderful perception in knowing just what each passenger brings in, and I have always got mine back, even after a ride of 24 hours or more in one train with passengers coming in and going out all the time, and I had no special tags on it either.

Leaving the main line at 7.00 a. m. after a night of more or less discomfort, we took the branch line for the remaining eight miles, passing through twelve tunnels, and at 8.30 a. m. arrived at the Kure station—200 miles in ten hours. The cars on the branch line—as on all branch lines—are generally of the box compartment type, cross seats and side doors, very similar to the English style.—*James F. Paige,* before New England Railroad Club.

Just Plain Railroading.

For the first time in 25 years there are no private wires running from Missouri Pacific's New York offices to St. Louis. President Bush has concluded that in the future he can dispense with these inasmuch as he intends to run the property from St. Louis. Hence the private wires went out of existence on July 1. Hereafter when officialdom, at 165 Broadway, wants to communicate with Mr. Bush, it will use Western Union lettergrams or the slower service provided by the United States mails.

Mr. Bush expects to save about $23,000 per annum in private wire charges. A few such economies and Mr. Bush will be able to save the amount of the added charge upon the company represented by his yearly salary. The recently retired president drew no salary.

In railway circles a belief is expressed that Mr. Bush's latest innovation should have a tremendous moral effect. There are several indications that Mr. Bush and Mr. Gould have some tacit understanding which provides for "hands off." If Mr. Bush is permitted to keep up his present pace for the next five years, Missouri Pacific stockholders will wake up some morning and find they own a real railway.—*Wall Street Journal.*

Laws Regulating Drinking on Trains.

A law has been passed by the Illinois legislature, going into effect on July 1, providing that any person who shall drink any intoxicating liquor, or who shall be intoxicated in or upon any railway smoking car, parlor car, day coach, interurban car or caboose car, in use for the transportation of passengers or in or about any station or platform, upon conviction thereof, shall be fined not less than $25 nor more than $100, or imprisoned for not less than 30 days nor more than 100 days, or both fined and imprisoned. Dining, sleeping and buffet cars are not mentioned in the act. Every conductor while on duty is authorized for the purpose of enforcing these provisions to exercise all the powers conferred on sheriffs and required to arrest any person violating them, the conductor in so doing acting for the state and not as an employee of the company, and being subject to a fine of from $10 to $25 if he refuses to act in such cases. The railway companies are required to keep copies of the act posted in conspicuous places at all stations, and failing to do so are subject to a fine of $50.

An Illinois law prohibiting the use of common drinking cups in trains and at railway stations went into effect on July 1. Some roads have met the situation by installing slot machines from which oiled paper cups may be obtained for a cent, and the Chicago, Burlington & Quincy, which has issued an order abolishing the use of the common cup on its lines in all states, is planning to have machines from which passengers may procure paper cups without paying anything. Bubbling cups will be put in at all large stations, as has already been done at many.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York; October 9-13, Atlantic City, N. J.

American Railway Association.—W. F. Allen, 75 Church St., New York; November 15, Chicago.

American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.

American Railway Engineering Association.—E. H. Fritch, Monadnock Block, Chicago; annual convention, March 19-21, 1912, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; annual, June 26, 1912, Quebec, Que.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; annual convention, May 22, 1912, Los Angeles, Cal.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; annual, November 6-10, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago, annual June 24, 1912, New York.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York; December 12-13, Louisville, Ky.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and August, Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLead, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.; annual, Buffalo, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio; annual, Aug. 15, Toledo, Ohio.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION, OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

OMAHA RAILWAY CLUB.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; annual, May 12, 1912, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa.; annual, Oct. 10, Colorado Springs, Colo.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; September 12-15, St. Louis, Mo.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; annual, October 20, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 18, 1912, Louisville, Ky.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, First National Bank bldg., Chicago, annual January 16-18, Chicago.

Traffic News.

Beginning July 17 freight service was inaugurated by the Chicago & North Western between Clinton, Iowa, and Davenport, using the line of the Iowa & Illinois Electric Railway from Comanche, Iowa, to Bettendorf, and the Davenport, Rock Island & Northwestern from Bettendorf to Davenport.

The attorney-general of Missouri, acting on request from other states, has called a convention, to be held in St. Louis, August 4, to discuss questions concerning suits now pending in the courts relating to railway rates. The states especially interested are Arkansas, Oklahoma, Minnesota, Kansas, Nebraska and Iowa.

Permanent reductions amounting to from ½ cent to 2 cents per 100 lbs. have been announced by the Great Northern in its rates on grain from points in central and eastern Washington to Puget Sound points, effective August 15. A reduction in wheat tariffs throughout eastern Washington and northern Idaho to Seattle and Spokane was announced by the Harriman lines on July 5.

The Pennsylvania Railroad, in pursuance of its plan to cultivate the friendship of the farmers, will make an elaborate exhibit at the American Land & Irrigation Exposition to be held in Madison Square Garden, New York City, next November. There will be a split-log drag, a model of the company's live stock car, models of ancient wagons and modern electric trains, illustrating the history of transportation; graphic charts; statistics of what the company has done to conserve the forests, and complete information about the success which the company has had in raising good crops on poor land on Long Island and elsewhere.

Germany's sea canal, the Kaiser Wilhelm, which connects the North Sea and the Baltic, with Kiel at its eastern terminus, reports that in 1910-11, 45,569 ships, with a net holding capacity of 7,580,000 tons, used the canal, and the revenue amounted to $875,000. Five years ago, the tonnage reached 5,800,000, and the receipts were $700,00, while 10 years ago the tonnage was 4,300,000 and receipts $525,000. Since 1899, reckoning by the ships' tonnage, canal traffic has doubled and returns have correspondingly increased. Last year there was an increase in the net registered tonnage of over 1,000,000 and in receipts of over $100,000, as compared with the previous year, at hitherto unprecedented record.

Protests have been filed with the corporation commission of Oklahoma by the railways in that state against an order it has proposed requiring the roads to furnish for theatrical parties of not less than 18 members a special coach and one baggage car at a minimum charge of $25, for parties of not less than 30 passengers a special coach and two baggage cars at a minimum charge of $40, and proportionate accommodations for larger parties. The roads have objected to the order on the ground that it reduces the minimum number of paid fares to be required to secure the additional accommodation, 25 fares being the minimum fixed by most roads to secure the special service. Interstate roads oppose the rule because it would cause confusion to have tariffs covering rates and service for theatrical parties in Oklahoma different from that class of tariffs in the other states.

At a hearing before the Interstate Commerce Commission board of suspension on August 17, regarding the new reciprocal switching rule and rates for the Chicago district, an agreement was reached by which the Chicago & Alton, the Atchison, Topeka & Santa Fe, the Wabash, the Illinois Central, the Chicago, Indianapolis & Louisville and the Chicago & Eastern Illinois have become parties to the new arrangement, which, up to this time, they have refused to do because the new switching rules provided that they should absorb the inbound switching rate on grain which has heretofore been absorbed by the eastern lines. When the roads named refused to subscribe to the rules the eastern roads raised the switching rates on coal received from them, which was to result, effective August 1, in an increase in the rates on coal to consignees. The new plan, including the provision that coal switching rates will be absorbed as in the past, will now go into effect August 1, and the switching rates

on grain will be advanced and will be absorbed by the lines parties to the agreement, but not on shipments coming over the six lines mentioned. Further negotiations to adjust their differences on the grain switching rates will be carried on by the roads.

In a notice sent to receivers of freight throughout the United States by the freight traffic committee of the Chicago Association of Commerce, with the view of educating shippers to save themselves the annoyance of receiving overcharge bills from the carriers, the following advice is given: "A large number of complaints come from receivers of freight respecting overcharges collected by the railways upon excessive weights and incorrect rates. Before payment of freight bills please carefully check the weights of the items received against the weights on expense bills; have rates verified when you have reason to believe they are incorrect; insist upon agent correcting the charges to basis of actual weight and tariff rates. In case of refusal on the part of the agent to make correction, notify the shipper, that action may be taken to have agent instructed to make proper adjustments in the future. It is our belief that co-operation between the consignor, the consignee and the carriers will prevent overcharges, thus removing a fruitful cause of annoyance to shippers and carriers."

Car Surpluses and Shortages.

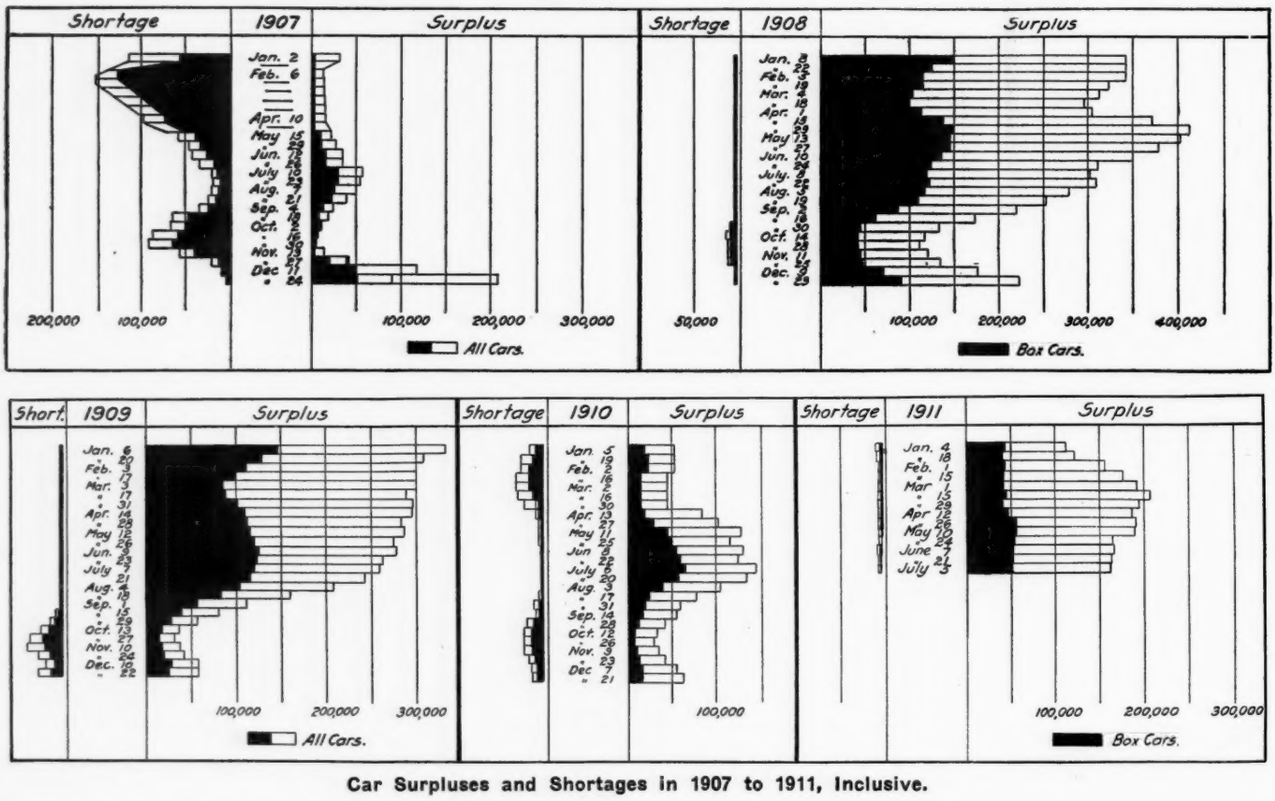
Arthur Hale, chairman of the committee on relations between railways of The American Railway Association, in presenting statistical bulletin No. 99, giving a summary of car shortages and surpluses by groups from March 2, 1910, to July 5, 1911, says:

"The surplus of all classes is 165,508, being 426 cars less than the total reported for June 21. There was little change in box cars and flats, while coal and gondolas show a decrease of 2,522, partially offset by an increase in miscellaneous of 2,095 cars. The shortages reported in groups 4 (middle Atlantic), and 11 (Canadian), have materially decreased. It will be noticed that last year there was an increase of about 18,000 in the surplus between the second period of June and the first period of July, while this year the surplus is practically stationary."

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—July 5, 1911	8	506	675	1,164	202	2,547	150	142	25	18	335
" 2.— " 5, 1911	26	3,159	122	18,265	7,025	28,571	3	0	2	7	12
" 3.— " 5, 1911	26	12,314	865	36,531	4,268	53,978	10	0	0	10	10
" 4.— " 5, 1911	10	1,612	119	2,850	1,227	5,808	23	0	0	0	23
" 5.— " 5, 1911	19	3,510	344	3,518	2,019	9,391	0	0	0	0	0
" 6.— " 5, 1911	28	10,729	1,253	3,230	6,955	22,167	10	20	9	0	39
" 7.— " 5, 1911	4	2,069	111	349	834	3,363	75	0	0	0	75
" 8.— " 5, 1911	17	7,705	222	2,260	3,338	13,525	0	0	0	0	0
" 9.— " 5, 1911	11	1.599	581	470	733	3,383	55	1	0	0	56
" 10.— " 5, 1911	22	9.017	1,635	1,706	8,981	21,339	18	0	1	0	19
" 11.— " 5, 1911	7	655	190	20	571	1,436	535	140	30	613	1,318
Total	178	52,875	6,117	70,363	36,153	165,508	879	303	67	638	1,887

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages in 1907 to 1911, Inclusive.

Foreign Crop Progress.

The United States Agricultural Department, commenting on foreign crops, says that conditions surrounding crops in Canada are, over most of the territory, pronounced flattering. Of the 15,500,000 acres under wheat this season, over 9,500,000 are in the spring wheat provinces, Saskatchewan, Manitoba, and Alberta; the increment in area, though perhaps not so great as

expected, amounted to 1,200,000 acres, as compared with an increase of 1,500,000 acres in 1910. Ever since the seed went into the ground the spring wheat lands have been saturated by opportune rains, and, with few exceptions, favored by forcing temperature. Present prospects, therefore, afford a refreshing contract to those at the same period a year ago, when much of the country was suffering the withering effects of drought.

In Argentina the newly sown wheat, oats, and flaxseed are said, under the influence of plentiful moisture, to have germinated well. Areas are believed to be heavily increased; popular opinion puts the surface under wheat 5 per cent. to 10 per cent. over the 15,500,000 acres sown last year. High prices are thought to have stimulated additional sowing of flaxseed. The 1910 wheat crop of Chile is reported insufficient for home needs, and imports are being made from Australia. The monsoon, the indispensable precursor of a favorable seed time on unirrigated soil in British India, broke in full force in mid-June, and heavy rains have already fallen over wide areas. Late reports, however indicate partial cessation of rainfall. Cotton planting is progressing in some localities of the empire.

The harvest in progress on the north coast of Africa is said to promise well in Algeria, where the yield of wheat is usually upward of 35,000,000 bushels, and of barley over 45,000,000 bushels. In the much less important producers, Tunis and Morocco, only a moderate outcome is expected. According to the June official report, the yield on the 1,250,000 acres of wheat in Egypt was likely to be "good" in upper Egypt, but in lower Egypt not quite up to the standard.

In Europe the wheat harvest is on in the southern latitude, beginning in Sicily in late May. Its progress northward through Italy, where better yields than last year are anticipated, has been preceded or attended by heavy rains, which may later show their effects on quality. In Spain, an official puts the wheat crop 20,000,000 bushels above the excellent yield of last season. The territory comprising France, the United Kingdom, Belgium, Holland, Germany, and parts of northern and central Russia suffered over extensive localities from lack of sufficient moisture during the first half of June.

Winter wheat and rye seem generally to have had effective power of resistance, but spring-sown crops, especially oats and barley, were in places severely tried, and the extent of their recuperating after the copious rains in the latter half of the month has not yet been determined. The hay crop over much of this area was seriously diminished, but the quality is generally excellent. In Austria-Hungary, Roumania, the Balkan states and southern Russia, precipitation in June seems generally to have been ample, and the progress of vegetation, on the whole, more satisfactory than in northern Europe.

As harvest moves northward in Europe, winter wheat and rye may, on the whole, be said to have fully maintained their former promise. The wheat crop of the United Kingdom, on an increased area, is regarded likely to furnish an average yield. France with diminished areas under both wheat and rye, promise a medium outturn of the former and a less satisfactory one of the latter.

Governmental Approval of a "Back Haul."

The New York State Public Service Commission, Second district, has ordered the New York Central to either stop its train No. 44 at Altmar, to take on passengers for Utica, or to make an arrangement whereby train No. 49 shall take passengers to Richland to connect with train No. 44 without expense by reason of the necessity of doubling to Richland in order to secure passage on train No. 44.

INTERSTATE COMMERCE COMMISSION.

The commission has authorized the Gulf & Ship Island temporarily to disregard the long and short haul clause of the law in making rates on tropical fruits imported at Gulfport.

The commission has suspended until November 14 a tariff filed by the Southern Pacific showing terminal charges and absorptions at Galveston, Texas, which was to have gone into effect July 18.

The attorney-general of Arkansas has filed with the commission a complaint against rates made by the express companies from points in Arkansas to cities in numerous other states on fruits, vegetables, butter and eggs.

Rates on Fir Lumber Reduced.

Oregon & Washington Lumber Manufacturers' Association v. Southern Pacific et al. Opinion by Commissioner Prouty.

Rate of $5 per ton on rough green fir lumber and lath from points in the Willamette Valley, except from the Wendling branch, to San Francisco and bay points, found unreasonable, and rate of $3.50 per ton prescribed for the future. Rate from the Wendling branch and from stations upon the west bank of the Willamette river should not exceed $3.75 per ton. Foregoing rates are not applied to mills located within the city of Portland, which take a uniform rate of $5 per ton upon all kinds of lumber. S. P. v. I. C. C., 219 U. S., 433, cited and distinguished. (21 I. C. C. 389.)

Conference Rulings.

A state statute permits the exchange of intrastate mileage books for advertising. Such books may not be used on any part of an interstate journey. 315.

Routes involving the transshipment of freight from a rail line to a water line or from a water line to a rail line are "rail-and-water routes," and routes composed of rail lines connected by car ferries over which the freight is ferried in the car constitute "car-ferry routes" and are understood to be included in the general term "all-rail." Where a shipper does not specify a particular route, or a rail-and-water route, the carrier's agent must consider car-ferry routes as available in performing the duty of routing a shipment over the cheapest route. 316.

The commission has no jurisdiction over claims for damages due to alleged errors in the transmission of telegraphic messages. 317.

In view of the amendment to section 15 of the act, paragraph *b* of Conference Ruling No. 214 is now amended so as to read as follows: (*b*) In order to secure desired delivery to industries, plants, or warehouses and avoid unnecessary terminal or switching charges, the shipper may direct as to terminal routing or delivery of shipments which are to go beyond the lines of the initial carriers; and his instructions as to such terminal delivery must be observed in routing and billing such shipments. When shipments are accepted without specific routing instructions from shipper, where all-rail rates and rail-and-water rates are available the carrier's agent must have the shipper designate which of the two he wishes to use. Carriers will be held responsible for routing shown in bill of lading. 321.

The authority conferred on the commission by the amendatory act of June 18, 1910, to suspend schedules stating new individual or joint rates, was not intended to withdraw from carriers the right to initiate their rates, and does not mean that in every case of advanced rates or charges the schedules should be suspended. The statute vests a discretion in the commission in that regard and contemplates that it will be exercised in a judicial spirit. Except in cases where it acts on its own initiative the commission will not ordinarily suspend the operation of a schedule unless the changes complained of are called to its attention at least 10 days before the effective date of the schedule, thus giving the commission time in which to act intelligently and to avoid discriminations that might result from the improper suspension of a schedule. Requests for such action by the commission should be made in the form of a complaint indicating the schedule by its I. C. C. number and specifically referring to the parts thereof as to which suspension is asked, together with reasonably detailed explanations as to the probable effect of the proposed new rates, fares, etc. 322.

It appearing that some confusion has been caused by the commission's conference rulings Nos. 48, 133, and its ruling of February 14, 1911, the following is issued in lieu of the three rulings above mentioned. The commission has no authority to control the disposition of an overcharge. The carrier must charge no other than its lawful rate and the failure to collect the full rate as to any shipment is a violation of the law, as is the collection of more than the full rate. The commission declines to declare that an overcharge may be offset as against

an uncollected undercharge; such offset is not within the power of the commission to authorize or condemn. 323.

It is unlawful for carriers to make special and discriminatory divisions of joint rates on locomotive fuel as between an originating or participating carrier and a purchasing carrier. In the division of joint rates a railway must be treated precisely as any other shipper is treated, and the commission will regard any special division as a device to defeat the published rate. All divisions on fuel coal must be made in good faith without respect to the fact that one of the carriers is the purchaser of such coal. 324.

An Order Permitting Bulked Shipments.

California Commercial Association v. Wells Fargo & Co. Opinion by Commissioner Lane.

In this case the question was first raised before the commission as to the right of a carrier to make its rates to base upon the ownership of the property transported. Where shipments belonging to, and intended ultimately for, various consignees had been united in a bulked shipment from one consignor to one consignee, the defendant had refused to apply the rate applicable on the shipment as a whole but had insisted upon making a separate charge on the package or packages intended for each ultimate consignee. The commission in its original report (14 I. C. C., 422), held that the practice of the defendant was unlawful. No order, however, has gone into effect owing to the fact that the legal question involved was taken into court in what is known as the Export Shipping case (14 I. C. C., 437). It was the contention of both the railway and the express companies in these cases that they might make rates with relation to the ownership of the property transported. The commission held to the contrary, and the Supreme Court of the United States has upheld the commission in its conclusion. I. C. C. v. D., L. & W. R. R. Co. (220 U. S., 235.) The commission, therefore, now makes an order forbidding express companies from discriminating against bulked shipments. (21 I. C. C., 300.)

Another Advance Rate Refused.

In re of the investigation and suspension of supplements No. 2 to transcontinental freight bureau westbound tariffs No. 1-L and No. 4-H, issued by C. W. Bullen, agent; J. F. Tucker, agent; and R. H. Countiss, agent; effective November 15, 1910. *Opinion by Commissioner Prouty:*

The commission held in *Burgess* v. *Transcontinental Freight Bureau,* 13 I. C. C. R., 668, that an advance upon hardwood lumber from 75 to 85 cents per 100 lbs. from Chicago territory and points west to the Pacific coast was unreasonable, and ordered the establishment for two years of the 75-cent rate. On the expiration of that order the defendants filed tariffs advancing the rate to 85 cents, which led to numerous protests from lumber shippers affected. Thereupon the commission began this proceeding and suspended the rates pending the same.

The original order referred only to lumber, and did not include staves and headings, which had formerly taken the lumber rate. For a time after the making of our order in the *Burgess case, supra,* carriers did not apply the 75-cent rate established by the commission to staves and headings, but subsequently did, so that today that rate applies to both these commodities. The advance is also made applicable to both commodities, and our proceeding and the complaint of the Arkansas Southern Manufacturers' Association put in issue the reasonableness of the advanced rate as applied to staves as well as to lumber.

The carriers admitted on the hearing that the same rate had in the past been uniformly applied to lumber and staves from eastern points of production to the Pacific coast, and stated that they knew of no reason why a distinction should be made in the future, although they were not prepared to admit that the rate should be the same.

Testimony was given showing the extent of the movement of staves from this territory to the Pacific coast, their value, the car loading, etc. From the whole record we are clearly of the opinion that, whatever may be true when staves are compared with lumber of a lower grade, there is no reason why staves and headings should not be accorded as low a rate as is applied to the hardwood lumber involved in this proceeding.

The testimony on the present hearing showed but two particulars in which a change of condition had occurred since the promulgation of our former order.

It appeared that the competition of foreign hardwoods was somewhat more forceful at the present time than formerly, and that while the consumption of such lumber was continually increasing upon the coast the amount shipped from the east was rather upon the decrease. Lumber manufacturers insisted that the effect of any substantial advance in the present rate would be to finally exclude eastern hardwoods from the market of the Pacific coast.

The carriers showed a substantial increase in operating expenses as compared with two years ago, due mainly to an advance in wages. These wage increases for the most part have not been long enough in force to determine their exact effect upon the cost of operation, but the net returns to these transcontinenal lines under old conditions were exceedingly liberal, and we believe that they will be ample under present conditions without any increase in rates. This, however, as was said in the recent advance cases, can only be satisfactorily determined by actual results.

After having fully heard the parties we are of the opinion that the proposed rate of 85 cents as applied to hardwood lumber and staves and headings from Chicago territory and west, being that territory from which the present 75-cent rate is in effect, would be unjust and unreasonable; that a rate of 75 cents per 100 lbs., on the present minimum, ought not to be exceeded for the future, and it will be so ordered. (21 I. C. C., 397.)

The Commission Left to Itself to Find the Facts.

Oshkosh Traffic Association et. al. v. Chicago & North Western et al. Opinion by Commissioner Harlan.

For some years sash, doors, blinds, and other house-trimming products have moved from Oshkosh, Fond du Lac, Wausau, Merrill, and Grand Rapids, all in the state of Wisconsin, to points in the states of Indiana, Michigan, Ohio and Kentucky, on the intermediate rates to and from Milwaukee, Manitowoc, or Chicago. These charges the complainants contend are unreasonable in and of themselves as well as discriminatory when compared with the joint through rates to the same destinations that are available to competing mills at Dubuque, Clinton, and other Mississippi river points. The petition prays for an order fixing reasonable joint through rates to the destinations in question.

The record is singularly bare of helpful suggestions by either party to the controversy. That the complainants have a substantial grievance is insisted upon by them and seems to be conceded by the defendants. Nevertheless the record leaves the commission practically to its own resources in arriving at a correct solution of the problem. While the defendants produced one witness at the hearing, his testimony did not touch the merits of the case, and they have not given the commission the benefit even of a printed brief to facilitate our examination of the matter. Nevertheless we have made some investigations of our own and have arrived at the conclusion that the present rates are excessive and should be reduced. The minimum carload weight on lumber, in a 36-ft. car, is 34,000 lbs. Sash, doors, and blinds of course cannot be loaded so heavily, and in a car of that length take a minimum weight of 24,000 lbs., both into Chicago and beyond. The carload earnings on the manufactured product at a rate of 1 cent in excess of the lumber rate would therefore be materially less than the carload earnings on lumber, although its value would probably be somewhat in excess of the value of the carload of lumber. On the other hand, it is clear that these products are not moving freely from the mill points in question into central freight association territory on the present adjustment of rates. While the defendants, as stated, would probably be satisfied with rates 3 cents higher than the lumber rates, no showing of record has been made to convince us that these commodities would move freely under such a rate adjustment.

From such light, as the record and our own investigations give us, we have reached the conclusion that the rates on sash, doors, blinds and house trimmings from the mill points in question to the destinations mentioned ought not to exceed 2 cents in excess of the lumber rates, and that any rates in excess of rates so constructed would be unreasonable. To destinations that lie, in a general way, east of a line drawn through Richmond, Ind., the rates by the car-ferry route of the Pere Marquette on traffic originating in the Oshhosh-Fond du Lac group are understood to be uniformly 2 cents less by the all-rail routes through Milwaukee, and on traffic from the Wausau-Merrill group 1½ cents less than by the all-rail routes through Chicago. (21 I. C. C. 385.)

STATE COMMISSIONS.

The Railroad Commission of Ohio has ordered the rates on coal on the Hocking Valley from Nelsonville to Toledo and intermediate points, reduced. The reductions are proportionate to the reduction from $1 per ton to Toledo to 85 cents per ton.

The Railroad Commission of Ohio has ordered the railway companies having team tracks in Akron to receive from the Baltimore & Ohio cars loaded on the B. & O.'s private side track, to be placed on the team tracks of the other roads. A joint rate on such cars is ordered, and the commission holds that this is a transportation service and not a switching service.

The Railroad Commission of Louisiana has ordered the New Orleans Great Northern to replace the spur or side tracks at Pool's Bluff. The side track was removed with the consent of the commission. On investigation it was found that the commission had given its consent on the strength of a statement made by the railway company which is at variance with the facts and evidence as now presented.

The new Board of Public Utilities Commissioners of New Jersey, on a petition for an order directing the Pennsylvania Railroad and the Pennsylvania Tunnel & Terminal to build a station at the tunnel shaft at West Hoboken, finds that the general purpose of the new line was to give the Pennsylvania Railroad an all-rail entrance into New York City, and to separate the through from the local traffic so that it could better serve both. After a personal inspection, and on recommendation of engineers who have made a careful study of the situation, the board refused to grant the petition.

The Board of Public Utilities Commissioners of New Jersey, in a memorandum, says that its attention has been called to certain published statements made in connection with the offering for sale of public utility securities issued under the law which provides that the consent of the Board of Commissioners must be obtained before the issue of new securities. These statements are so worded, the commission says, as to be capable of misleading the public and particularly possible investors by inducing the belief that this commission confirms the financial and business standing of issuing corporations *as a whole* by approving the issue of certain securities of such corporations. Such approval does not imply any confirmation of the business or financial standing of the issuing corporation as a whole.

As heretofore reported in these columns, the Railroad Commission of Louisiana has been making an exhaustive study of complaints brought against the facilities in Louisiana of the Louisville & Nashville. There were three general complaints. The first was a complaint as to the inadequacy of the passenger station facilities in New Orleans. The commission finds that this complaint is justified only in so far as the train sheds are concerned, these not being long enough, and orders that they be extended to cover the longest trains operated by the company. The second complaint is in regard to freight sheds. Here the commission finds that by building brick walls at each end of the principal freight sheds, with proper division walls on the interior of the building, the fire risk would be greatly reduced, with a consequent reduction in the insurance rate both for shippers and for the railway, and an order is issued accordingly. The third proposition before the commission relates to the track and bridges of the defendant company in the state of Louisiana. A great deal was said in the testimony and statements of numerous parties before the commission about the condition of the track and bridges of the Louisville & Nashville previous to the inspection made by the commission. Letters filed with the commission also refer to the defendant company's roadway in such language as to make the commission feel that if the charges were true the company had been grossly neglectful of its highest duty to the public, viz.: to maintain an absolutely safe track. After hearing the evidence of the chief engineer of the defendant company, the commission made a personal inspection by going over the railway in a special coach and engine, together with the officers of the company. The Louisville & Nashville, in Louisiana, is constructed of good material, well ballasted, and is smooth, firm and safe. As compared with other railways in the state of Louisiana, it is far superior to many, and inferior to none. The special complaint was made about Rigolet's bridge. In this case the commission finds that the work, which is now being done by the Louisville & Nashville, to replace a bridge destroyed by the great storm of 1909, is satisfactory and safe in all respects.

The Washington Public Service Commission.

By an act of the state legislature, the Washington Public Service Commission has been created to take the place of the State Railroad Commission. The new commission is to consist of three members, appointed by the governor, with the approval of the senate, for a term of six years, with annual salary of $5,000 each.

The commission is empowered to fix all rates, and it is authorized to establish joint and through rates. It may order repairs to railway property and may suspend traffic until such repairs are made. It may investigate accidents, and every public service company is ordered to report all such to the commission which result in injury or death of a person. All complaints served on companies are to be given a hearing not later than ten days thereafter. Orders of the commission become effective twenty days after service. The penalty for violation of an order is $1,000 per day for each offense, an officer or employee responsible for such violation is held guilty of a misdemeanor.

The commission may inspect books and papers of any public service company, and examine any employee under oath. Every company is required to answer all questions asked; it must file annually a full statement with the commission, listing amount of capital stock issued, equipment, franchises, number of employees, salaries, and the like, as well as accidents occurring, cost of same, amounts expended for improvements. A report monthly of receipts and expenses may be required at the discretion of the commission.

In the valuation of property the commission is given the full power to investigate every detail. Appeal for a review of the findings of the commission in any instance, may be made to the superior court of the county, within thirty days of the date of the commission's order, and the court may issue notice of restraint of enactment of such order, pending the outcome. Appeal may be carried from the superior to supreme court, the proceedings before the lower court constituting the record.

If the commission finds a charge excessive, it may order the company to refund to the complainant the overcharge with interest. If such overcharge is not paid within the time fixed by the order, and suit is commenced for recovery, the commission's findings and order will constitute the record of evidence. Complaints for overcharges must be made within two years to the commission, dating from the time the cause of action accrues; any petition for enforcement of order shall be filed in the court within one year from the date of the commission's order.

To assist the commission a secretary shall be appointed at a salary of $2,000 per year, a rate clerk and satistician at a salary not to exceed $3,000, an inspector of safety appliances at a salary not to exceed $3,000, an expect accountant at a salary not to exceed $1,800, a stenographer at a salary not to exceed $1,800, and any other assistants the commission may deem needed.

The law creating this commission went into effect June 9, 1911.

COURT NEWS.

Judge Bean, of the United States District Court at Portland, Ore., on July 14 sustained the demurrer of the Oregon railway commission to a bill filed by the Southern Pacific Company for injunction to restrain the commission from enforcing its order reducing from 2 to 30 per cent. the class rates between Portland and points on the Oregon & California, a road operated by the Southern Pacific as lessee. Permission to file an amended bill of complaint was granted to the railway.

The government has begun suit in the United States Circuit Court at Philadelphia, against the Philadelphia & Reading, to test the legality of its ownership in and control of the Philadelphia & Reading Coal & Iron Co. and other coal companies. The charges are similar to those in the suit against the Lehigh Valley noticed in the *Railway Age Gazette* of July 14, p. 101; namely, that the maintenance of a separate company is a means for evading the commodities clause of the Interstate Commerce law. It is charged that the railway company has advanced more than $70,000,000 to the P. & R. coal company without charging adequate interest.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

S. L. Schoonmaker has been appointed co-receiver with H. M. Atkinson, of the Atlanta, Birmingham & Atlantic.

J. P. Pelham, chief clerk of the Gulf & Ship Island, has been appointed acting auditor, with office at Gulfport, Miss., succeeding to the duties of E. L. Hall, auditor, resigned.

F. A. Clark, auditor of traffic of the Erie Railroad at New York City, has been appointed auditor, succeeding J. G. Livengood, resigned. C. D. Ward, assistant auditor of traffic, has been appointed auditor of freight accounts. A. J. Moran has been appointed assistant auditor of freight accounts, and P. J. Reilly has been appointed auditor of passenger accounts, all with offices at New York City.

Operating Officers.

J. B. Elliott has been appointed district superintendent of the Pullman Company, with office at Omaha, Neb., succeeding William Lucas.

W. H. Gunzelman, formerly trainmaster of the Chicago & Alton at Roodhouse, Ill., has been appointed chief despatcher of the First and Second districts of the Chicago, Indianapolis & Louisville, with office at La Fayette, Ind.

W. W. Rupert, assistant trainmaster of the Allegheny division of the Pennsylvania Railroad, at Oil City, Pa., has been appointed assistant trainmaster of the Buffalo division, with office at Mayville, N. Y. C. H. Sourwine succeeds Mr. Rupert, with office at Oil City, Pa.

W. M. Ansley, trainmaster of District 1, British Columbia division of the Canadian Pacific, at Revelstoke, B. C., has been appointed trainmaster of District 3, with office at Nelson, succeeding H. W. McLeod, who succeeds Mr. Ansley as trainmaster of District 1, with office at Revelstoke.

C. W. Hotchkiss, general manager of the Chicago, Indiana & Southern and the Indiana Harbor Belt at Chicago, has resigned his office with the latter road. George Hannauer, superintendent of the Chicago, Indiana & Southern and general superintendent of the Indiana Harbor Belt at Gibson, Ind., has resigned as superintendent of the C. I. & S., and will devote his time exclusively to the Indiana Harbor Belt. H. A. Ziesel, superintendent of the latter road at Kankakee, Ill., succeeds Mr. Hannauer.

Perry S. Sampson, whose appointment as superintendent of the Illinois division of the Chicago & Eastern Illinois, with office at Salem, Ill., has been announced in these columns, was born June 12, 1865, at Brazil, Ind., and received a common school education at Brazil and at Sedalia, Mo. He learned telegraphy in 1882 while a messenger boy for the Mutual Union Telegraph Company at Richmond, Ind., and in the same year began railway work as an operator and assistant clerk in the office of the engineer maintenance of way of the Pittsburgh, Cincinnati, Chicago & St. Louis, and the next year was transferred to the freight department. In 1884 he went with the Grand Rapids & Indiana as an operator and bill clerk, and was with the Baltimore & Ohio from 1885 to 1886. He was then out of railway service until 1889, when he went with the Chicago & Eastern Illinois as a brakeman, and he has been with that road continuously since that time, having been promoted successively to conductor, train despatcher, chief despatcher, trainmaster of construction, trainmaster, assistant superintendent and supervisor, and to superintendent as above.

Traffic Officers.

M. J. Frazier has been appointed general live stock agent of the Denver, Northwestern & Pacific at Denver, Colo.

A. L. Pitman has been appointed contracting freight agent of the Missouri, Kansas & Texas of Texas, with office at Houston, Tex.

C. L. Voltz has been appointed soliciting freight agent of the Mobile & Ohio, with office at Birmingham, Ala., succeeding J. G. Putnam, Jr., resigned.

Frank H. Dearing has been appointed a traveling freight agent of the Georgia Railroad, with office at St. Louis, Mo., succeeding J. N. Garland, deceased.

H. C. Franks, commercial agent of the St. Louis & San Francisco at San Antonio, Tex., has resigned to go with the San Antonio & Aransas Pass.

S. J. Ellison, general passenger agent of the Great Northern, with office at St. Paul, Minn., has resigned, effective August 1, to engage in other business.

George B. Haynes, immigration agent of the Chicago, Milwaukee & St. Paul at Chicago, has been appointed assistant general passenger agent, with office at Chicago.

H. C. Moran, contracting agent of the Missouri, Kansas & Texas at Houston, Tex., has been appointed soliciting freight agent of the Kansas City Southern, with office at Houston.

The office of traveling freight agent of the Lake Erie & Western, the Ft. Wayne, Cincinnati & Louisville, and the Northern Ohio at Sandusky, Ohio, has been transferred to Indianapolis, Ind.

J. C. Leacy, contracting freight agent of the Great Northern at Duluth, Minn., has been appointed traveling freight agent, with office at Winnipeg, Man., and W. J. Doherty succeeds Mr. Leacy.

W. C. Wherritt, soliciting agent of the Louisville & Nashville at New Orleans, La., has been appointed assistant contracting agent, with office at New Orleans, and W. L. Dulaney succeeds Mr. Wherritt.

E. Z. Giblon, city passenger agent of the St. Louis & San Francisco at Cincinnati, Ohio, has been appointed traveling passenger agent of the Union Pacific and Southern Pacific, with headquarters at Cincinnati.

W. T. Webster, commercial agent of the Chicago, Indianapolis & Louisville at Grand Rapids, Mich., has been appointed general agent at Chicago, succeeding S. J. Cooke, and Mr. Cooke succeeds Mr. Webster at Grand Rapids.

T. V. Murray, soliciting freight agent of the Gulf, Colorado & Santa Fe at Dallas, Tex., has been appointed a traveling freight agent, with office at Dallas, succeeding T. E. Brazelton, promoted. J. C. Stephens succeeds Mr. Murray.

W. H. Wynne has been appointed traveling freight and passenger agent of Morgan's Louisiana & Texas Railroad & Steamship Company, with office at Alexandria, La., succeeding H. A. White, transferred to Lake Charles, La., as local agent.

F. B. Wurzbacher, general agent of the White Pass & Yukon Route at Skaguay, Alaska, has been appointed general agent at Seattle, Wash., with jurisdiction over traffic matters in the Vancouver office, succeeding I. W. Dudley, resigned.

W. B. Ryan, traveling freight agent of the Illinois Central at Jacksonville, Fla., has been appointed commercial agent, with office at Little Rock, Ark., succeeding W. H. Hays. W. J. Middlekauff, contracting freight agent at Jacksonville, succeeds Mr. Ryan.

R. N. Beason, freight soliciting agent of the Southern Railway at Huntsville, Ala., has been appointed freight soliciting agent at Memphis, Tenn., succeeding H. P. Wade, resigned to go into other business. T. C. Sanford succeeds Mr. Beason, with office at Huntsville.

Felix M. Williams has been appointed division freight agent of the Texas & Pacific, with office at Shreveport, La., and the office of commercial agent at Shreveport, heretofore held by H. S. Hinton, has been abolished. D. L. Ray has been appointed traveling freight agent, with headquarters at Fort Worth, Tex.

W. B. Wetherell, agent of the Union Steamboat Line at Milwaukee, Wis., has been appointed commercial agent of the Erie, with office at Grand Rapids, Mich. W. J. Fitzgerald has been appointed assistant general agent of the Erie, with office at Milwaukee, and will look after the interests of the Union Steamboat Line, succeeding Mr. Wetherell.

C. W. Ford, whose appointment as general superintendent of the Grand Junction & Grand River Valley, with office at Grand Junction, Colo., succeeding J. H. Brinkerhoff, has been announced

in these columns, has been appointed also general traffic manager, succeeding Mr. Brinkerhoff, who has left the service of the company to engage in other business.

G. K. Stark, formerly traveling freight agent of the Missouri Pacific at Pittsburgh, Pa., has been appointed traveling freight and passenger agent of the El Paso & Southwestern, with office at Pittsburgh, succeeding J. L. Fox, transferred. W. K. Hardesty has also been appointed traveling freight and passenger agent of the El Paso & Southwestern at Pittsburgh.

Thomas W. Jacobs has been appointed European traffic agent of the Erie Railroad, with office at London, E. C., England, succeeding Wells, Fargo & Co. Express, and all communications heretofore adressed to D. G. Mellor, general European agent, Wells, Fargo & Co. Express, relative to the European traffic of the Erie Railroad, should be sent to Mr. Jacobs, effective August 1.

E. L. Throgmorton, traveling freight agent of the Illinois Central at Memphis, Tenn., has been appointed contracting freight agent of that road and the Yazoo & Mississippi Valley, with office at Memphis. H. S. Gooch has been appointed a traveling freight agent of the Illinois Central at Louisville, Ky. M. L. Costley, traveling freight agent of the Illinois Central and the Yazoo & Mississippi Valley at New Orleans, La., has been transferred to Brookhaven, Miss., and C. F. Verlander, traveling freight agent at Vicksburg, Miss., has been transferred to New Orleans, succeeding Mr. Costley. H. F. Stanley, Jr., has been appointed a traveling freight agent of the Yazoo & Mississippi Valley, with headquarters at Natchez, Miss.

Engineering and Rolling Stock Officers.

Charles Morlock has been appointed assistant division engineer of the Baltimore & Ohio, with office at Philadelphia, Pa.

F. W. Bailey, superintendent of bridges and buildings of the Missouri, Kansas & Texas, with office at Denison, Tex., has resigned to engage in other business.

T. H. Williams has been appointed master mechanic of the International & Great Northern, with office at Mart, Tex., succeeding W. J. McGee, resigned to go with the Texas & Pacific.

N. Rowe has been appointed roadmaster of the Atchison, Topeka & Santa Fe, with office at Newton, Kan., succeeding W. S. Boyce. A. W. Ross has been appointed roadmaster, at Abilene, Kan., succeeding T. J. Moriarty.

The titles of W. C. Stears, superintendent of shops of the Cincinnati, Hamilton & Dayton, at Lima, Ohio; F. C. Pickard, assistant master mechanic, at Moorefield, Ind., and W. G. Rose, assistant master mechanic, at Ivorydale, Ohio, have been changed to that of master mechanic.

William B. Ott, whose appointment as master mechanic at the Trenton (N. J.) shops of the Pennsylvania Railroad, has been announced in these columns, entered the service of the Pennsylvania Railroad on October 8, 1897, as a draftsman in the office of the principal assistant engineer of the Philadelphia & Erie division. In October of the following year he was appointed master carpenter of the Western division, and in January, 1901, was made inspector at the Altoona shops. In June, 1903, he was appointed assistant master mechanic at the Harrisburg shops, and in December of the same year was made assistant engineer of motive power of the Buffalo & Allegheny Valley division. He was appointed assistant engineer of motive power at the Altoona shops on February 1, 1906, which position he held at the time of his recent appointment as master mechanic as above noted.

William Elmer, Jr., who has been appointed superintendent of motive power of the Buffalo & Allegheny Valley division of the Pennsylvania Railroad, with office at Buffalo, N. Y., as has been announced in these columns, entered the service of the Pennsylvania Railroad as an apprentice at the Meadows (N. J.) shops on October 1, 1896, and in April, 1898, he was transferred to the Altoona (Pa.) shops in the same capacity. On October 10, 1898, he was appointed to special duties in the office of the superintendent of motive power, and in January, 1900, he was assigned to duty on the Interchange Street Railway, at Atlantic City, N. J. He was appointed assistant master mechanic in October, 1900, at the Altoona shops, and in January, 1903, was made assistant engineer of motive power of the Pennsylvania Railroad division. In February, 1906, he was appointed master mechanic of the Pittsburgh (Pa.) shops, which position he held at the time of his recent appointment as superintendent of motive power.

Robert K. Reading, whose appointment as superintendent of motive power of the Eastern Pennsylvania division of the Pennsylvania Railroad, with office at Altoona, Pa., has been announced in these columns, entered the service of the Pennsylvania Railroad on May 13, 1880 as a special apprentice at the Renova shops. From July, 1882, to November, 1884, he was on leave of absence, taking a mechanical engineering course, and then re-entered the service of the company as a special apprentice. In February, 1887, he was transferred to the office of the superintendent of motive power, and in January, 1892, he was promoted to assistant foreman of engines of the Baltimore division. He was appointed master mechanic of the Erie shops in April, 1892, and was made master mechanic of the Baltimore (Md.) shops in February, 1900. The following August he went to the West Philadelphia (Pa.) shops in the same capacity, and on August 1, 1903, he was promoted to superintendent of motive power of the Philadelphia & Erie division and the Northern Central Railway. In April, 1906, he was appointed superintendent of motive power of the Buffalo & Allegheny Valley division, which position he held until his recent appointment as above noted.

A. W. Gibbs, who has been appointed chief mechanical engineer of the Pennsylvania Railroad, with office at Philadelphia, Pa., as has been announced in these columns, was born October 27, 1856, at Fort Fillmore, N. Mex. He entered the service of the Pennsylvania Railroad in March, 1879, as a special apprentice at the Altoona (Pa.) shops, remaining in that position until June, 1881, and was then for four months draftsman. He went to the Richmond & Danville, now a part of the Southern Railway, in October, 1881, in the same capacity, and in August, 1886, was appointed master mechanic of the Atlantic & Charlotte division, and in October, 1888, was made master mechanic of the Virginia Midland division. He was appointed superintendent of motive power of the Central of Georgia in September, 1890, and when that position was abolished in July, 1892, he was again appointed master mechanic of the Richmond & Danville. Mr. Gibbs re-entered the service of the Pennsylvania Railroad in July, 1893, as assistant mechanical engineer. In September, 1902, he was appointed superintendent of motive power of the Philadelphia, Baltimore & Washington, and since January 1, 1903, he was general superintendent of motive power of the Pennsylvania Railroad for the lines east of Pittsburgh.

Purchasing Officers.

Edward Morris, general foreman at the general stores of the Rock Island Lines at Silvis, Ill., has been appointed district storekeeper of the Third district, with office at Shawnee, Okla., succeeding C. H. Rost, promoted.

Special Officers.

S. C. Wilson has been elected secretary-treasurer of the Kansas City division of the American Association of Railroad Superintendents and manager of the Missouri Valley Demurrage and Storage Bureau, with office at Kansas City, Mo., succeeding in both offices J. H. Ashley, resigned.

OBITUARY.

Benjamin T. White, general attorney of the Chicago & North Western, with office at Omaha, Neb., died at Omaha on July 15.

Nicholas Densmore, a native of Minnesota, and for many years prominent in railway construction work in West Virginia, Kentucky and Tennessee, died in the village of Umala, near the Chacarilla copper mines, La Paz, Bolivia, S. A., on June 10. Mr. Densmore, who was about 60 years of age, was associated for a number of years with the firm of Bolan & Dillon in railway construction work on the Guayaquil-Quito Railroad, the Cerro de Pasco Railroad and the Bolivia Railway, and had also constructed roads for the Bolivian government. During the past three years he devoted all of his time to mining interests in the Quimza Cruz mountains and the Chacarilla copper region.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Intercolonial is said to have ordered 5 locomotives from the Canadian Locomotive Company. This item is not confirmed.

The Canadian Northern is said to have ordered 20 consolidation locomotives from the Canada Foundry Company. This item is not confirmed.

The Baltimore & Ohio has ordered 10 Mallet (0-8-8-0) locomotives from American Locomotive Company. These locomotives are similar to those described in the daily edition of *Railway Age Gazette* of June 14. The dimensions of the cylinders will be 26 in. and 41 in. x 32 in. The diameter of the driving wheels will be 56 in., and the total weight in working order will be 468,500 lbs.

CAR BUILDING.

Swift & Company is in the market for a few additional tank cars.

The Cold Blast Transportation Company, Chicago, is in the market for 100 tank cars.

The Montreal Street Railway has ordered 25 pay-as-you-enter cars from the Ottawa Car Company.

The Philadelphia Rapid Transit Company has ordered 30 subway cars from the J. G. Brill Company.

The Chicago, Memphis & Gulf is in the market for 100 freight cars, including box and flat cars.

The Boston Elevated has ordered 25 steel car bodies from the Standard Steel Car Company, and 25 from the St. Louis Car Company.

The St. Louis & San Francisco is in the market for 19 coaches, 12 chair cars, 3 passenger and baggage cars and 3 mail and baggage cars, and not for the equipment mentioned in the *Railway Age Gazette* of July 7.

The Intercolonial is said to have ordered 230 box cars, 20 flat cars, 25 dump cars, 2 baggage cars and 1 refrigerator car from the Canadian Car & Foundry Company, and 100 freight cars, 2 postal cars and 2 stock cars from the Nova Scotia Car Company. This item is not confirmed.

IRON AND STEEL.

The Chinese Government is in the market for 9,000 tons of rails.

The Chilian Government is in the market for 10,000 tons of rails.

The Chesapeake & Ohio is in the market for 1,000 tons of bridge material.

The New York, Ontario & Western is in the market for 1,100 tons bridge material.

The Boston & Albany has ordered 1,000 tons of bridge material from Pennsylvania Steel Company.

The Delaware & Hudson has ordered 1,200 tons of bridge material from the Pennsylvania Steel Company.

The Atchison, Topeka & Santa Fe has ordered 9,910 tons of bridge material from the American Bridge Company for its bridge over the Missouri river at Sibley, Mo.

The Chicago, Milwaukee & St. Paul, mentioned in the *Railway Age Gazette* of May 12 as having ordered 40,000 tons of rails, has specified that 1/10 of 1 per cent. metallic titanium shall be used in this order.

General Conditions in Steel.—During the past week the Steel Corporation has increased its mill operations to 70 per cent. of capacity and its shipments, until they are now larger than at any time since the first of the year. Railways continue to withhold their equipment orders, but bridge material and export business are accountable for a large share of the operations. Reports of the crops are good, so a continued improvement in the steel industry is looked for.

Supply Trade News.

The Strauss Bascule Bridge Company, Chicago, has received an order from the city of New Orleans to put up a 60-ft. clear-span bridge over the Old Basin canal at Hagan avenue, New Orleans, La.

The Roberts & Schaefer Company, Chicago, has been awarded a contract by the Chicago, St. Paul, Minneapolis & Omaha, for designing and building, complete in operation, a 200-ton single counterbalanced bucket locomotive coaling station of frame construction to be installed at Merrillan, Wis.

The Standard Tool Company, Cleveland, Ohio, has opened a western branch at 552 West Washington boulevard, Chicago, where a complete stock of all styles of twist drills, reamers, milling cutters, taps, drill chucks, taper pins, etc., made by the company will be carried for immediate delivery of order.

The Hayes Track Appliance Company, Richmond, Ind., recently received an order for 100 model AP derails from the Havana Central, for shipment to the United Railways of Havana, at Havana, Cuba. The company was able to make this shipment on the same day the order was received. Shipments of derails have also been made recently to Karachi, India.

Lewis B. Rhodes, formerly superintendent of motive power of the Virginian Railway, has been made southern manager, a newly created position, of the Ward Equipment Company, New York. Mr. Rhodes was born in 1864 at Macon, Ga. He received his education in the high schools at Macon and began railway work in the latter part of 1880 on the Central of Georgia. He was later a machinist and was then made a foreman on the same road. In 1889 he left that company to go to the Georgia, Southern & Florida, since which time he has been consecutively, until 1900, locomotive engineer, shop foreman, general foreman and foreman of locomotive repairs. He was appointed master mechanic of this road in 1900, and in April, 1910, he was made superintendent of motive power of the Virginian Railway. He resigned this position in December, 1910, and has only just recovered from a six month's illness.

Lewis B. Rhodes.

The General Electric Company, Schenectady, has received an order from the Philadelphia Rapid Transit for 30 two-motor car equipments for use on its elevated division, and 50 two-motor equipments for use on its surface division. The equipments for the elevated division consist of two 125 h. p. motors with Sprague-General Electric type M control, while those for the surface lines consist of two 60 h. p. motors with K-36 control.

Negotiations have been about completed for the sale of $9,753,000 Illinois Steel Company debenture bonds of 1940, held in the treasury of the United States Steel Corporation. The financing will be done by J. P. Morgan & Co., New York. The proceeds of the issue will be used for capitalizing new construction completed and the redemption of $6,900,000 Illinois Steel Company 5 per cent. non-convertible debentures which fall due on April 1, 1913.

J. A. & W. Baird & Company, Boston, Mass., have transferred their interests in the manufacture and sale of Rex Flintkote roofing and other waterproofing and insulating specialties, to the Flintkote Manufacturing Company, Boston, Mass. This will also permit them to give their undivided attention to the other branches of their business. The Flintkote Manufacturing Com-

pany, a corporation whose directors and stockholders have been identified for years with J. A. & W. Baird & Company, will on July 15, 1911, take over the roofing, waterproofing and insulating business in its entirety and continue it on the same general lines as heretofore.

F. A. Casey, vice-president of the Ashton Valve Company, Boston, Mass., died at Billerica, Mass., on July 15, from cancer of the liver. Mr. Casey was born in Bedford, Mass., August 17, 1846. He had 15 years' experience as a locomotive engineman on the Fitchburg, now part of the Boston & Maine; on the Lake Shore & Michigan Southern, and on the Old Colony, now part of the New York, New Haven & Hartford. He entered the service of the Ashton Valve Company over 30 years ago, and later went to the New York Air Brake Company for a few years, returning to the Ashton Valve Company to become vice-president and manager of the railway department. He held this position 16 years. His illness began from an injury received in a railway accident on the Boston & Albany two years ago, but he remained actively engaged in business up to the last few months. Mr. Casey attended the American Railway Master Mechanics' Association conventions for 33 consecutive years, and was chairman of the Railway Supplymens' Association, 1901-1902.

F. A. Casey.

TRADE PUBLICATIONS.

SOOT REMOVER.—G. L. Simonds & Co., Chicago, have published a 32-page catalog describing the Vulcan soot cleaner. The application of this device to different types of boilers is illustrated and explained, also the principle on which it works. It is claimed that with this device stationary boilers may be cleaned more quickly and thoroughly than is possible by hand cleaning. The fireman simply turns on the steam and operates the steam jets from the outside of the boiler away from the flying soot and dirt.

LOCOMOTIVES.—The American Locomotive Company, New York, has issued bulletin 1009 describing the 230-ton articulated compound locomotives recently built for pusher service on the Baltimore & Ohio. These engines are 40 per cent. heavier and more powerful than the pioneer articulated compound which was built for the same road seven years ago. With a consolidation, this engine will handle a train of 2,200 tons at 18 m. p. h. on a 1 per cent. grade. This locomotive does the work of two consolidations and, it is claimed, saves 38 per cent. in the cost of maintenance. The general dimensions of the locomotive and the erection drawings are also included in the bulletin.

MECHANICAL COAL PASSER.—The Ryan-Johnson Co., Chicago, has published a comprehensive booklet on its mechanical coal passer for locomotive tenders. The bearing this device has on economy in fuel and saving of labor is discussed in an interesting manner, and it is clearly shown what the coal passer does for both the engine and the fireman. The construction and operation of the device is explained by diagrams in which the different parts are lettered so that a clearer description may be given. This coal passer is in operation on the Atchison, Topeka & Santa Fe, the Great Northern, the Chicago, Burlington & Quincy, the Chicago & North Western and the Baltimore & Ohio. It may be applied to old as well as new tenders, and to the U-shaped tank as well as the water-bottom tank. The catalog contains 24 pages, of which 11 pages are devoted to clear-cut illustrations.

Railway Construction.

New Incorporations, Surveys, Etc.

ALBERTA CENTRAL.—An officer is quoted as saying that this company is carrying out the grading work on a section with its own men. About 40 miles of line has been built, and contracts let for work on between 60 and 70 miles. It is expected that about 100 miles will be under construction this coming fall. The company was organized to build from Red Deer, Alb., westerly to the Grand Trunk Pacific in the Yellow Head Pass. Application was made to the parliament of Canada to build from Saskatoon, Sask., northeast to Hudson Bay, with terminals at both Fort Churchill and Port Nelson. J. C. Moore is vice-president, Red Deer.

ATCHISON, TOPEKA & SANTA FE.—The Pecos & Northern Texas has been opened for business from Slaton, Tex., southeast via Sweetwater to Coleman, 190 miles.

BALTIMORE & OHIO.—The Consolidation Coal Company in the development of its 100,000 acre tract of big vein coal in Pike and Letcher counties, Kentucky, has undertaken the construction of about 30 miles of railway from Shelby Junction, on the Chesapeake & Ohio. For this purpose the Big Sandy & Elkhorn Railway was incorporated. This latter company is to be acquired by the Baltimore & Ohio, on the basis of cost of construction with interest. The Consolidation Coal Company is developing mines with a minimum output capacity of 3,000,000 tons per annum. It is expected that the coal from this section will pass over the Chesapeake & Ohio branch to the Cincinnati gateway until such time as a new crossing of the Ohio river may be effected, as has been under consideration, at some point between Huntington and Ironton. It is understood that the object of the Baltimore & Ohio in acquiring an interest in the new railway was with a view of assuring the routing of the large tonnage via the Cincinnati, Hamilton & Dayton.

BIG SANDY & ELKHORN.—See Baltimore & Ohio.

CALIFORNIA ROADS (Electric).—The city council of Los Angeles, Cal., is securing right-of-way for a municipal railway, to be built from Los Angeles south to the harbor of San Pedro, 23 miles.

CANADIAN NORTHERN.—Vice-president Sir Donald D. Mann announces that contracts for the Canadian Northern Ontario extension from Sellwood Junction, Ont., west to Port Arthur, 550 miles, have been let. Press reports say that the contracts have been let to Foley Brothers, St. Paul, Minn., and to the Northern Construction Company, Winnipeg, Man. (June 9, p. 1333.)

The section of the Toronto-Ottawa line from Toronto to Trenton, about 100 miles, will be open for inspection by the government by August. It is expected that this line will be open for train service east as far as Kingston this coming fall, and will be completed to Ottawa in about one year.

Plans are being made to secure an entrance into Montreal, Que., by a tunnel through the mountains in the north, but no action will be taken until a report of the experts now working on this scheme has been made.

CANADIAN PACIFIC.—The Windsor Mills, Eastman & Mansonville branch of the eastern division has been extended from Mansonville, Que., to North Troy, five miles.

According to press reports, a contract has been given to Palmer Brothers & Hemmins, Vancouver, B. C., to build the branch from Duncan, on the Esquimalt & Nanaimo, to Cowichan lake, 25 miles. Work is to be started in a few weeks. (July 7, p. 64.)

CATSKILL TRACTION CO.—An officer writes that application has been made to the New York Public Service Commission, Second district, for a franchise and to issue bonds. The company plans to build from Leeds, N. Y., northwest to Cairo, 6.75 miles, and has surveys made. Herman C. Cowen, president, Catskill.

CENTRAL CANADIAN RAILWAY & POWER COMPANY.—Plans have been filed by this company to build from Winnipeg, Man., to the beaches and harbors of the east and southeast shore of Lake Winnipeg. The plans include a line from East Selkirk, northeasterly to Thalburg, thence to Fort George on Winnipeg river, a few miles south of Fort Alexander. From Thalburg another

line is to be run north to Balsam Bay, thence following the lake shore to Victoria beach. It is understood that the Canadian Pacific is back of the project.

Chicago, Indianapolis & Louisville.—An officer is quoted as saying that this company will extend the line from Switz City, Ind., to Linton, six miles. The work is to be started in a short time. The trackage arrangements with the Illinois Central between these places expired June 1.

Chicago, Memphis & Gulf.—This road has been extended from Phillipy, Tenn., north to Hickman, Ky., 11 miles.

Cleveland, Cincinnati, Chicago & St. Louis.—The Evansville, Mt. Carmel & Northern has been opened for business from Evansville, Ind., north to Mt. Carmel, Ill., 34.8 miles, and is being operated as a part of the Cairo division.

Copper River & Northwestern.—An officer writes that the main line from Cordova, Alaska, northeast to Kennecott, 196 miles, was put in operation on March 29. Surveys were recently made up McCarthy creek, extending 12 miles from the proposed junction at Mile 191, and preliminary surveys are now being made from this junction point up the White river country, covering about 60 miles of line. Both these proposed extensions will pass through mineral lands, but it is undecided when actual construction work will be started. (June 2, p. 1296.)

De Queen & Eastern.—An officer is quoted as saying that the company is planning to build an extension from the present eastern terminus at Dierks, Ark., northeast to Hot Springs, about 70 miles.

El Paso & Southwestern.—Bids are wanted up to July 25 by J. L. Campbell, engineer maintenance of way, El Paso, Tex., for grading and masonry work on 66 miles of railway to be built in Arizona. The grading work calls for the handling of 2,600,000 cu. yds.; foundation excavation, 30,000 cu. yds., and the masonry work constructing 36,000 cu. yds. of concrete. (July 14, p. 104.)

Esquimalt & Nanaimo.—See Canadian Pacific.

Evansville, Mt. Carmel & Northern.—See Cleveland, Cincinnati, Chicago & St. Louis.

Fort Worth Southern Traction Company.—Organized in Texas with $1,500,000 capital, to build an electric line from Fort Worth, Tex., south to Cleburne, 32 miles. Surveys have been made and the right-of-way has been secured. The incorporators include: C. H. Clifford, W. A. Hanger and W. C. Forbes, Fort Worth.

Georgia, Florida & Alabama.—This company, operating a line from Carrabelle, Fla., north via Tallahassee to Richland, Ga., 182 miles, is planning to complete a direct line from Pensacola through timber and agricultural districts to the coal and mineral territory of northern Alabama, by securing existing lines and building extensions.

Georgia & Florida.—This company has opened for business a new branch from Sparks, Ga., south to Adel, 2.4 miles.

Gilmore & Pittsburgh.—This road is now open for passenger service between Armstead, Mont., Leadore and Salmon, Idaho, 100.3 miles, with a branch from Gilmore, Idaho, to Leadore, 18.5 miles.

Grand Trunk Pacific.—The Lake Superior division has been extended from Graham, Ont., for 252.4 miles west to Winnipeg, Man., where connection is made with the main line west. New branches have also been opened for business from Melville, Sask., north to Canora, 55.2 miles, and from Tofield, Alb., south to Mirror, 70.9 miles.

Great Northern.—An officer writes that the contract recently let to Guthrie & Co., St. Paul, Minn., is for laying track and putting up six bridges on a 12-mile section between Princeton, B. C., and Coalmont, along the Tulameen river. (July 14, p. 105.)

Hocking Valley.—An officer writes that land has been bought as a site for new through freight yards at South Columbus, Ohio. The land for the new yard is on the south side of the present line between Parsons avenue and Louckbourne road, and outside of the right-of-way contains about 120 acres. This has been laid out in shape suited for yard purposes and is approximately 7,200 ft. long, with a maximum width of about 920 ft.. The contract for the grading has already been let. The necessary filling material, about 250,000 cu. yds., will be taken from a mound about 30 ft. in height, located about one-quarter mile from the proposed yard on the opposite side of the main track. For northbound trains there will be ten arriving tracks, each of 65 cars capacity and 3,500 ft. long, on the north end of the yard, and a similar arrangement of tracks for southbound trains is proposed to be located at the south end of the yard.

Iberia, St. Mary & Eastern.—According to press reports, work is to be started soon on the line from New Iberia, La., southeast to Berwick City, opposite Morgan City, about 50 miles. F. M. Welch, president, New Iberia.

International & Great Northern.—This company is planning to spend $1,000,000 for improvements, it is said, as soon as the reorganization has been adjusted. The line from San Antonio, Tex., south to Laredo, 150 miles, is to be relayed with 75-lb. rail, and new rails are also to be put in at other places, aggregating about 100 miles. Improvements are to be made at station points, and betterments of the roadbed over the entire system, including new ballasting, are planned.

Mexico North Western.—An officer writes that construction work is now under way from Terrazas station, about six miles south of Neuva Casas Grandes, Chihuahua, Mex., south to Madeira, 116 miles. About 100 miles is graded and 95 miles of track has been laid. The remaining 16 miles is expected to be finished during 1911. This work will complete a connecting link between the section extending south from El Paso, Tex., to Terrazas and the section northwest from Tabalopa, near Chihuahua, to Madeira. Work is under way on a branch from a point on the main line, a short distance north of where the continental divide is crossed, southwest to Chuicpupa, 45 miles. Grading has been finished on five miles and 20 miles additional is under contract. A branch about 15 miles long is being built from San Antonio, which is on the line between Chicuahua and Madeira, south to Cusihuiriachic. The grading and bridging is completed on this branch and the track will be ready soon. Some of these extensions in Northern Mexico traverse a rough section of the Sierra Madre, the work is expensive, and includes the excavation of 11 tunnels, the two longest being 2,219 ft. and 3,838 ft. respectively. (June 9, p. 1334.)

Mexican Roads.—The Chamber of Commerce of Mazatlan, Mex., has petitioned the national government to build a line between that port and Durango. It is the intention to have the new line form part of the National Railways of Mexico. Surveys for such a line were made some time ago.

Missouri, Arkansas & Gulf.—A contract has been given to P. A. Herrington, Houston, Mo., it is said, for completing the grading on a 35-mile section between Rolla, Mo., and Licking. The line is eventually to be extended south to Bakersfield, in all 125 miles. Gilbert Lay, president, St. Clair. (May 5, p. 1085.)

Nacogdoches & Southeastern.—This road has been extended from Dockville, Tex., south to Dunham, seven miles. (April 28, p. 1016.)

National Railways of Mexico.—This company has finished converting the branch line that runs from Acambaro, Mex., to Eruapan, 152 miles, from narrow to standard gage.

Plans are said to be under consideration for a large amount of construction work to be carried out during the next two years. The first improvement on which work will be started is a line between Tampico, Mex., north to Matamoras, about 300 miles; also on a link in the Mexico City-Matamoras short line.

It is understood that the line now being built by Richard Honey and associates, of Mexico City, between Pahuca and Zimapan is to be extended to Tampico and then taken over by the National Railways of Mexico and operated as part of the government system.

Tentative plans are under consideration for extending the Mexican Southern from the present terminus, a short distance south of Oaxaca, to some port on the Pacific coast; also to carry out important improvements on the Interoceanic.

New Orleans, Mobile & Chicago.—An officer writes regarding the propsed extension to be built from the present northern terminus at Middleton, Tenn., north to Jackson, about 40 miles, that the company has not yet completed the surveys for this line. (April 14, p. 925.)

NORTHWESTERN PACIFIC.—An officer writes that work is now under way closing the gap between Willits, Cal., and Shively, 105 miles. It is expected to have the work finished in about two years. The company has taken over the operation of the Hammond road, which extends from Eureka, north about 20 miles, but nothing has been done regarding building an extension along the coast further north.

NOVA SCOTIA ROADS (Electric).—Surveys are being made, it is said, for an electric line from Lunenburg, N. S., to Riverport, 12 miles, with a spur to Park Creek. T. G. Nichol, Mahone Bay, is the promoter.

OAKLAND & ANTIOCH (Electric).—An officer writes that contracts are being let to build an extension of 20 miles, to complete a line from Antioch, Cal., southwest via Black Diamond, Baypoint, Concord, Lafayette and Walnut Creek to Antioch, about 35 miles. The line is now in operation for 23 miles. S. L. Napthaly, president; W. Arnstein, vice-president. (March 10, p. 479.)

OHIO & KENTUCKY.—This road has been extended from Cannal City, Ky., to Malone, seven miles.

OREGON-WASHINGTON RAILROAD & NAVIGATION CO.—The Madras line of the Oregon division has been opened for business from Deschutes Junction, Ore., south to Madras, 101 miles.

PECOS & NORTHERN TEXAS.—See Atchison, Topeka & Santa Fe.

PIOCHE-PACIFIC.—Incorporated in Nevada with $250,000 capital, and office at Pioche, Nev. The plans call for building from Pioche to Royal City, in Lincoln county, 12 miles. Frank M. Foote, president; E. A. Culbertson, vice-president; F. R. Wooley, secretary and treasurer, all of Salt Lake City, Utah.

RAPID TRANSIT INTERURBAN.—An officer writes that this company was chartered in November, 1907, to build from Muskogee, Okla., southwest via Tecumseh to Chickasha, about 160 miles, with a branch from Tecumseh northwest to Guthrie, about 60 miles, and another branch from Tecumseh south to Sulphur, 58 miles. Surveys have been made for the branch from Tecumseh south via St. Louis, Asher, Stratford, Hart, Dolberg and Palmer to Sulphur. J. W. Saxon, president, Tecumseh, and W. T. Forsythe, engineer, Philadelphia, Pa.

ROWLESBURG & SOUTHERN.—An officer writes that work is now under way on a line from Rowlesburg, W. Va., south to Parsons, about 20 miles. The work on the first seven miles is quite heavy. G. G. Satzinger, president, New Castle, Pa., and Monroe & Downs are the engineers.

ST. LOUIS SOUTHWESTERN.—This company expects to finish work on the extension from Hamilton, Tex., to Comanche by July 15. While no definite plans have been made, it is understood that the question of building a further extension beyond Comanche is under consideration, on which work may be started this fall. (April 14, p. 912.)

SANTA MARIA VALLEY.—Incorporated in California with $300,000 capital to build from Betteravia, Cal., to the Santa Maria oil district, 15 miles. Hugh McKinney and P. H. McPherrin are incorporators.

SOUTHERN TRACTION CO.—Announcement has been made that the line will be built from Dallas, Tex., to Waco, with a branch from Ferris to Ennis and Corsicana. Right-of-way has been secured on about 15 miles. J. F. Strickland, president, Dallas. (April 7, p. 878.)

SOUTHERN PACIFIC.—A contract is said to have been let for building a section of 100 miles from Natron, Ore., southeast to Klamath Falls.

SUNSET RAILROAD.—This road has been extended from Fellow, Cal., to Shale, two miles.

WASHINGTON, IDAHO & MONTANA.—This road has been extended from the western terminus at Palouse, Wash., to Lairds, one mile, and from Bovil, Idaho, north to Purdue, two miles.

YANKTON & NORFOLK.—The line, for which surveys were made about 25 years ago, from Norfolk, Neb., to Yankton, S. D., may now be built, the rights and property having been bought, it is said, by C. S. Cleaver, Chicago.

YAZOO & MISSISSIPPI VALLEY.—An officer writes regarding the reports that a connecting line is to be built from Natchez, Miss., south to Woodville, about 40 miles, that no appropriation has been made for this work, but that the company is now making a preliminary survey over the route.

RAILWAY STRUCTURES.

ALTOONA, PA.—The Pennsylvania Railroad is constructing a semi-circular subway for the use of pedestrians under the Hollidaysburg branch tracks at Union avenue, Altoona, between Twenty-second and Twenty-third streets. The subway will be 55 ft. long, 8 ft. wide and 9 ft. high at the crown of the arch, and is being built of concrete.

BOZEMAN, MONT.—The Gallatin Valley will build a new station, it is said, at Bozeman.

CALWA, CAL.—The Atchison, Topeka & Santa Fe has let contracts for grading a new yard to relieve the congestion in the Fresno terminals. A 15-stall roundhouse and the necessary water and oil facilities will be provided.

DULUTH, MINN.—The Canadian Northern will build a steel and concrete 10-stall roundhouse with a 70-ft. turntable, a blacksmith and machine shop 100 ft. x 60 ft. and a storage and office building 110 ft. x 30 ft.

EL PASO, TEX.—The Atchison, Topeka & Santa Fe has begun work on a viaduct over its tracks on Smelter Road. The estimated cost is $76,000.

EVERETT, WASH.—The Northern Pacific has given a contract to the H. Chase Co., Everett, for the erection of shop buildings at Everett.

ORCHARD PARK, N. J.—The New York Public Service Commission, Second district, has authorized the Buffalo, Rochester & Pittsburgh to abandon its present station in the village of Orchard Park, town of East Hamburg, Erie county, on condition that a new station be built near the crossing of its line over Buffalo street, in Orchard Park.

PARIS, TEX.—The St. Louis & San Francisco, it is reported, will build a freight depot which will also provide for the local offices. The building will be of brick construction, one or two stories high.

PUYALLUP, WASH.—The Puget Sound Electric will build a new station, it is said, at Puyallup.

SAVANNAH, GA.—An officer writes that the company is carrying out improvements, to include considerable track work, at Hutchinson Island. There is to be an extension to the warehouse on the east side of slip No. 3, 490 ft. long, to cost about $50,000; extension to covered shed on west side of slip, 400 ft. long, to cost about $25,000, and the dredging work in the slip to secure a minimum depth of 24 ft. will cost about $50,000. The bulkhead work being carried out on some 1,400 lin. ft., will cost about $7,000. Press reports say that contracts have been let to the Atlantic Gulf & Pacific Co. for the dredging work, and for the extensions to buildings and wharves, to Budwell and Hillyer, Jacksonville, Fla.

SOUTH CHICAGO, ILL.—The Pennsylvania has completed plans for building two vertical lift bridges over the Calumet river at South Chicago, to have a double track, 210 ft. skew truss spans with a clear waterway of 140 ft. and a vertical lift of 120 ft. above water level. The substructures will be concrete caissons to bed rock.

The Lake Shore & Michigan Southern is having plans prepared by Waddell & Harrington of Kansas City, Mo., for a vertical lift bridge over the Calumet river at South Chicago. The bridge will be a four track skew truss span, 210 ft. long and will have a clear waterway of 140 ft. and a vertical lift of 120 ft. above water level. The substructure will be cement caissons resting on rock.

SEATTLE, WASH.—The Oregon-Washington Railroad & Navigation Company is having plans made for a new coaling station to be built at Seattle. The estimated cost of the improvements is $16,500.

WINNIPEG, MAN.—Announcement is made that the Canadian Pacific will build a large addition to the Royal Alexandra Hotel at Winnipeg.

Railway Financial News.

Boston & Maine.—At auction 2,273 shares of Boston & Maine common stock, the balance remaining unsubscribed for of authorized issue last December of 106,637 shares, were sold in one lot at 105¼ to Kidder, Peabody & Co., Boston, Mass.

Brockville, Westport & Northwestern.—It is said that this property is to be placed in the hands of a receiver, no interest having been paid on the bonds for four years. The Knickerbocker Trust Co., New York, trustee for the bonds, had made an application for immediate sale of the road. This road runs from Brockville, Ont., to Westport, 45 miles.

Canadian Northern Alberta.—The London Stock Exchange has listed £647,200 ($3,236,300) 3½ per cent. first mortgage debenture stock, guaranteed by the Dominion of Canada.

Central Arkansas & Eastern.—The Guaranty Trust Co. and Rhodes & Co., both of New York, are offering a block of first mortgage 5 per cent. bonds of July 1, 1910-1940, of the Central Arkansas & Eastern, guaranteed principal and interest by the St. Louis Southwestern. The total authorized issue is $3,000,000, of which $730,000 are outstanding. The bonds are secured by a first mortgage on the road from Stuttgart, Ark., to England, and on the road from Rice Junction, Ark., north to Hazen, a total of 45 miles.

Chicago & Eastern Illinois.—In order to perfect the consolidation of the Evansville & Terre Haute and the Chicago & Eastern Illinois, the Evansville & Terre Haute has filed a mortgage for $1,284,000 on all its property. The money is to be used to redeem the 25,666 shares of the capital stock of the company.

Dawson, Grand Forks & Stewart River.—At a meeting of the holders of the prior lien debentures and the consolidated 6 per cent. debenture stock, it was decided to postpone the repayment of the principal of the prior lien debentures from July 1, 1911, to July 1, 1914, and that interest on both the stocks be suspended to 1914.

Denver, Northwestern & Pacific.—A letter from Colonel D. C. Dodge, chairman of the committee of the board of directors of the Denver Railway Securities Co., says in part:

"The company [Denver Railway Securities Co.] has been organized in Colorado with an authorized capital stock of $10,000,000 for the purpose of purchasing all of the stock, bonds, notes and other obligations of the Colorado-Utah Construction Co. and of the Denver, Northwestern & Pacific owned by the estate of D. H. Moffat, and issue its entire capital stock of $10,000,000 in payment of said purchase. Among the principal and most valuable assets to be purchased is $8,232,000 (half common and half preferred) stock of the Denver, Northwestern & Pacific, and $8,000,000 4 per cent. first mortgage bonds of the railway company subject to a lien of $4,000,000 6 per cent. collateral trust notes. There is offered for sale at $750,000, $5,000,000 of stock of the Securities company. Out of this sum it is proposed to pay $500,000 of the principal of the $4,000,000 collateral trust notes under an agreement that the balance, $3,500,000, shall be extended."

Great Northern.—A press despatch from Winnipeg says that the Great Northern has made arrangements to have trackage rights over the "Regina Boundary Line" of the Grand Trunk Pacific, which is now under construction.

Gulf, Florida & Alabama.—This company, which has been formed with an authorized capital stock of $7,500,000 and a funded debt of $10,000,000, has been organized to take over certain existing roads and to build certain extensions. See this company under Railway Construction.

Megargel & Co., New York, are offering $1,000,000 first mortgage 5 per cent. bonds of 1911-1961, at 85, with a bonus of 60 per cent. in common stock and 20 per cent. in preferred.

Indiana Harbor Belt.—The Lake Shore & Michigan Southern and the Michigan Central, which together own all of the $2,450,000 stock of the Indiana Harbor Belt, have sold 40 per cent. to the Chicago, Milwaukee & St. Paul and the Chicago & North Western.

Kansas City, Mexico & Orient.—Edwin Hawley and Theodore P. Shonts have been elected additional directors.

Kansas City Southern.—The Oklahoma City *Oklahomian* says that reports coming from authentic sources state that negotiations are being carried on for the taking over by the Kansas City Southern of the Fort Smith & Western.

Maxton, Alma & Southbound.—This company, which was previously announced as having taken over the Alma Railroad, is now in operation and has filed a freight tariff between Alma, N. C., and Midway, seven miles.

Norfolk & Western.—Up to June 30 there had been $8,284,000 convertible 4 per cent. bonds of the Norfolk & Western exchanged for stock. The total issue of these bonds is $25,569,000.

St. Louis Southwestern.—Rhoades & Co. and the Guaranty Trust Co., both of New York, are offering at 98 $730,000 Central Arkansas & Eastern first mortgage 5 per cent. bonds, of July 1, 1910. The bonds are guaranteed, principal and interest, by the St. Louis Southwestern. See March 10, 1911, page 481.

Sierra & Mohawk.—This company has taken over the Sierra Valleys Railway, which was sold under foreclosure on June 30, 1909, by the Nevada-California-Oregon Railway. The Sierra Valleys Railway runs from Plumas Junction, Cal., to Clio, 71 miles.

Sierra Valleys Railway.—See Sierra & Mohawk.

Valdosta, Moultrie & Western.—The Georgia Railroad Commission has authorized the company to issue $630,000 first mortgage bonds, the proceeds to be used in part to retire $300,000 first mortgage 5 per cent. bonds due 1939 but subject to earlier retirement. The road runs from Valdosta, Ga., to Moultrie, 42 miles.

Wichita Falls & Northwestern.—This company has filed with the secretary of state of Oklahoma a certificate of increase of stock from $1,000,000 to $2,000,000.

FOREIGN RAILWAY NOTES.

According to dispatches received from San Jose, an American capitalist has applied to the government of Costa Rica for authority to construct an electric railway which, starting from Puerto del Coco, on the bay of the same name, shall continue as far as Liberia, and thence south to La Barranca.

Paul Gonzenbach, of Manta, Ecuador, has the contract for building a short railway from that port to Santa Ana, work on which has already been commenced. Proposals are also being received for constructing the railway from Ambato, Ecuador, to the Arajuano river, but it is not probable that anything will be done now, owing to lack of funds.

While it was thought that the recent plague and the consequent scarcity of coolies would seriously hinder the progress of the reconstruction work on the Antung-Mukden Railway, Manchuria, the authorities have stated that such has not been the case, as the plague abated in time to allow the spring work to commence in the usual manner. Everything, in fact, has gone with remarkable smoothness, and it is expected that the entire work will be finished by November 3, the anniversary of the Japanese Emperor's birthday. It will be remembered that on that date last year the Antung-Chikuanshan section of the road was completed and that a large celebration was held in honor of the occasion. The Chikuanshan tunnel, the last to be finished, was completed a short time ago. It is 3,828 ft. long, and the miners who began at opposite ends met exactly at the center. It is stated that the calculations were not more than an inch or two out and that the same was true of the other long tunnels on the line. There are 24 tunnels in all, the combined length of which is 26,542 ft. The tunnels are to be brick-lined throughout. This work, however, will not, it is thought, be finished until August. The drills used were of American make and as a rule worked by compressed air. The miners for the most part were Koreans; they possess a remarkable aptitude for this class of work.